

CONTRACT NO.

**GUJARAT WATER INFRASTRUCTURE LIMITED
GANDHINAGAR**



Bid Documents for Supply, Installation, Testing & Commissioning of 700 KW, 989 RPM, 6.6 KV HT 3-Phase Induction Motor compatible to existing base frame of Wilo make HSCF Pump installation with suitable Coupling & other required accessories including Insurance, Transportation, Loading, Unloading, Inspection charges etc. complete for NC-6, Khirai Pumping Station, Tal-Maliya, Dist-Morbi

Estimated Cost:- Rs. 37,98,020.00

**VOLUME - IIB
TECHNICAL SPECIFICATION FOR ELECTRO-MECHANICAL AND
INSTRUMENTATION WORKS**

**Chief General Manager (Project)
Gujarat Water Infrastructure Limited
1st floor Block - 1, Jivraj Mehta Bhavan, Sector-10 Gandhinagar,
Gujarat - 382015**

GENERAL TECHNICAL CONDITIONS & REQUIREMENTS**1 SCOPE OF CONTRACT**

- 1.1 This specification covers the manufacturing, testing at manufacturer's site, delivery at site, unloading, handling and storage at site, complete erection, final checkup painting, testing and commissioning of HT Motor at Khirai pumping stations with associated accessories to be supplied under this contract to achieve a guaranteed performance coordinated with commercial conditions of the contract to the entire satisfaction of GWIL.
- 1.2 Any minor / hidden item of work either supply and / or erection of materials / equipment which have not been specifically mentioned in the specifications but are necessary to complete the work for trouble free and efficient operation and guaranteed performance of the entire plant / system / equipment offered shall deemed to be included within the scope of this contract and shall be provided by contractor without any extra price to the GWIL.
- 1.3 The project information is indicated in the enclosed specification. It is advisable that the bidder should visit the site and apprise himself of all the site conditions prior to preparing the bid.

2 EQUIPMENT AND SERVICES TO BE INCLUDED BY CONTRACTOR UNDER THESE SPECIFICATIONS:

- 2.1 Mechanical and electrical works required at pumping stations under Bulk Pipeline Projects.
- 2.2 The contractor shall take the responsibility for all the testing and inspections at manufacturer's works to be conducted in manner as specified in this specification in the presence of GWIL's representative. The inspection will be at the cost of contractor. The third party inspection shall also be carried out in the presence of the GWIL representative i.e. jointly and inspection charges of third party agency shall be born the contractor.
- 2.3 Transportation of all equipments packed in the specified way from the manufacturer's works to the project site inclusive of all intermediate handling.
- 2.4 Unloading of equipments from railway wagons / trucks at site handling and proper storing at site in the approved way under security.
- 2.5 Opening of package, checking, tallying, sorting out and inspection of equipment received at the site and lodging of insurance claims if any.
- 2.6 Taking delivery of equipments / materials from contractor's site stores, transportation to erection site. If erection is delayed arrange for proper storage of the equipment / material in approval ways.
- 2.7 Erection inspection testing start up and running of the equipment and complete plant at guaranteed performance.
- 2.8 Furnishing all erection and commissioning supervision service. The contractor responsible for maintenance of such equipment during guarantee and commissioning period.
- 2.9 The contractor shall also arrange technical expert of equipment from proprietary supplier to site as and when felt necessary until the commissioning guarantee run of the plant is completed.

- 2.10 In case of range in the motor rating depending on the efficiency of the rating of the associated electrical equipment shall be modified accordingly.
- 2.11 Initial filling of oil lubricants, grease etc for the equipment.
- 2.12 Complete list of commissioning and maintenance spares parts for guarantee period trouble free operation and maintenance of the mechanical and electrical equipment.
- 2.13 Require Nos. of all relevant drawings, Data and instruction manuals.
- 2.14 All ancillary work as per price bid.

2.25 RESPONSIBILITY

It is the intention of the GWIL to achieve coordinate effect. The installation erection of machinery is linked up with civil construction of pumping station testing and commissioning work is linked up with the obtaining of electrical connection / power GWIL no doubt will be doing his best to see that these inter connected activities are completed at appropriate time. However, contractor is not entitled for any claim, escalation of whatsoever commissioning at a date later than the stipulated time. Necessary extension of time will be granted in case if it is established that the erection/ testing /commissioning could not be achieved in stipulated time on account of reasons beyond control of contractor. This factor should be carefully noted as no claim what so ever nature will be entertained on an account of such situations.

2.26 GUARANTEE

The contractor has to furnish guarantee for all the equipments supplied by him for a period of 12 months from the date of handing over the pumping station to GWIL after completion of SITC work.

2.27 DELIVERY

The contractor has to furnish the BAR - Chart & PERT Chart for the pumping station and the same followed strictly so as to commence the work as per the schedule

2.28 CO ORDINATION BETWEEN DIFFERENT AGENCIES

It is the responsibility of the contractor to co ordinate with different agencies i.e. sub supplier and civil contractor so as to commissioning the pumping station in scheduled time.

3.0 THIRD PARTY INSPECTION

Inspection and testing of the Motors by concern authority shall be carried out by third party inspection agency in the presence of GWIL's representative (i.e. jointly) at manufacturer's works. QAPs along with manufacturers' cross sectional drawings, characteristic curves (if any), material (s) of construction etc.

- 3.1 That the equipment installed complies with specification in all particulars and is of the correct rating for the duty and site conditions.
- 3.2 That all items operate efficiently and quietly to meet the specified requirements.

- 3.3 That all non current carrying metal work is properly and safely grounded in accordance with the specifications.
- The contractor shall provide all necessary instruments and labour for testing and shall make adequate records of test procedures and readings, shall repeat any tests requested by the consultant / GWIL and shall provide test certificates signed by a properly authorized person such test certificates shall Cover all works.
- 3.4 If tests fail to demonstrate the satisfactory nature of the installation or any part thereof then no claims for the extra cost of modifications, replacements, or retesting will be considered. GWIL's decision as to what constitutes a satisfactory test shall be final. The above general requirements as to testing shall be read in conjunction with any particular requirements specified elsewhere.
- 5 GWIL reserves right to ask for the corporate guarantee from any or all the bidder for the performance and overall completeness in accordance to GWIL's requirements. Specifically, for in time completion of contractual works in accordance to the technical requirements in best workmanship manner.
- 5.1 GWIL reserves the right to split the work / distribute the works among bidders.
- 5.2 GWIL reserves the right to accept or reject the tenders with technical deviation, at the discretion of competent authority.

1.0 GENERAL

This part covers conditions pursuant to the contractor and will form an integral part of the contract. The following provisions shall supplement general conditions, detailed specification and requirements.

2.0 LIMIT OF CONTRACT

Equipments furnished shall be complete in every respect with all mountings, fittings, fixtures and standard accessories normally provided with such equipments and/or needed for erection, completion and safe operation of the equipments as required by applicable codes though they may not have been specifically detailed in the technical specification, unless included in the list of exclusions. All similar standard components / parts of similar standard equipments provided shall be interchangeable with one another.

3.0 ENGINEERING DATA

- 3.1 The contractor shall furnish complete engineering data of each sets of equipment such as name of manufacturer, the type of model of each principal item of equipment proposed to be furnished and erected in the annexure, standard catalogues design, the specification number and the name of the project. If the standard catalogue pages are submitted the applicable items shall be indicated there in. All titles, noting, markings, and writing on the drawing shall be in English. All dimensions should be in metric units.
- 3.2 All manufacture fabrication works in connection with equipment prior to the approval of the drawing shall be at the contractor's risk. The contractor may make any changes in the design which are necessary to make any equipment confirm to the provisions and intent of the contract and such changes will again be subject to the approval by the GWIL. Approval the contractor's drawing or works by the GWIL shall not relieve the contractor from any of the responsibility and liabilities under the contract.
- 3.3 Drawings shall include all installation and detailed piping drawings wherever applicable. All piping 100 millimeter and larger shall be routed in detail and smaller pipe shall be shown schematically or by isometric drawings. All drawings shall be fully corrected to agree with actual "As Built" construction.
- 4.0 DESIGN IMPROVEMENTS**
- 4.1 GWIL may propose changes in the specification of the equipment or quality thereof and if the parties agree upon any such changes the specification shall be modified accordingly.
- 4.2 If any such agreed upon change is such that it affects the price and schedule of completion, the party shall agree in writing as to the extent of any change in the price and / or schedule of completion before the contractor proceeds with the change.

The following such agreement provision thereof shall be deemed to have been amended accordingly.

- 5.0 The following documents shall be sent by registered post to the GWIL by contractor within 3 days from the date of dispatch, to enable the GWIL to make progressive payments to the contractor.

INVOICE (6 copies)

PACKING LIST (6 copies)

TEST CERTIFICATE (3 copies)

- 5.1 The contractor shall prepare detailed packing list of all packages and containers, bundles & loose material forming each and every consignment dispatched to site. The contractor shall further be responsible for making all necessary arrangements or loading, unloading and other handling right from his work till the site and also till the equipment is erected, tested and commissioned. He shall be solely responsibility for proper storage and safe custody of all equipments.

- 5.2 All fine, rental, demurrages, warfare and other expenses incurred due to delayed clearance of the material or any other reason shall be to the account of the contractor.

6.0 PROTECTION TO PLANT

- 6.1 All coated surface shall be protected against abrasions impact, discolorations and any other damages. All exposed threaded portion shall be suitably protected with either a metallic or non-metallic protecting device. All ends of all valves and piping and conduit equipment connections shall be properly sealed with suitable device to protect them from damage. The parts which are likely to get rusted due to exposure to weather, shall also be properly treated and protected in a suitable manner.

7.0 MATERIALS HANDLING AND STORAGE

- 7.1 All the equipment furnished under the contract and arriving at the site shall be properly receive, un loaded transported and stored in the storage spaces by the contractor at his cost.
- 7.2 Contractor shall be responsible for examining all the dispatches and notify the GWIL immediately of any damage, shortage discrepancy etc for the purpose of the GWIL information only. The contractor shall submit to the GWIL every week a report detailing all the receipts during the work. However the contractor shall be solely responsible for any shortages or damage in transit, handling and / or in storage and erection of the equipment at the site.
- 7.3 The contractor shall maintain and accurate and exhaustive record detailing out the list of all equipment received by him for the purpose of erection and keep such record open for the inspection of the GWIL at any time.

7.4 All equipment shall be handled very carefully to prevent any damage or loss. No bare wire ropes, string etc shall be used for unloading and/or handling of the equipment stored. The equipment shall be properly protected to prevent damage either to the equipment or to the floor where they are stored. The equipment from the store shall be moved to the actual location of the appropriate time so as to avoid damage of such equipment at site.

7.5 All electrical panels, control gears, motors and such other devices shall be properly dried by heating before they are installed and energized. Motor bearings, slip rings, commutators and other exposed parts shall be protected against moisture ingress and corrosion during storage and shall be periodically inspected. Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion due to prolonged storage.

All the electrical equipment, such as Motors, Generators, etc shall be tested for insulation resistance at least once in three months from the date of receipt till the date of commissioning and record of such measured insulation values maintained by the contractor. Such records shall open for inspection by the GWIL.

7.6 The consumables and other supplies likely to deteriorate due to storage must be thoroughly protected and stored in a suitable manner to prevent damage or deterioration in quality by storage.

7.7 All the materials stored in the open or dusty location must be covered with suitable water proof and flame proof covering material wherever applicable.

7.8 The contractor shall be responsible for making suitable indoor storage facilities to store all equipments which require indoor storage. Normally all the electrical equipment, such as motors, control gears, generators exciters and consumable like electrodes, lubricants, etc shall be stored in the closed storage space. The GWIL in addition may direct the contractor to move certain other materials which in GWIL opinion will require indoor storage, to indoor storage areas which the contractor shall strictly comply with.

8.0 CONTRACTOR'S MATERIALS AT GWIL SITE

8.1 The contractor shall bring to site all equipment, component, parts, materials, including construction equipments, tools and tackles for the purpose of the works under intimation to the GWIL. All such goods from the time of their being brought shall not on any account be removed or taken away by the contractor or his subcontractor without the written permission of the GWIL. The contractor shall nevertheless be solely liable and responsible for any loss or destruction thereof and damage thereto.

8.2 The GWIL shall have the lien on such goods for any sum or sums which may at any time be due to or owing to him by the contractor, under in respect of or by reasons of the contract. After

giving a fifteen (15) days notice in writing of his intention to do so, the owner shall be at liberty to sell and dispose of any such goods in such as he shall think fit including public auction or private treaty and to apply the proceeds in or towards the satisfactions of such or sums due as aforesaid

After the completion of the works, the contractor shall remove from the site under the direction of the purchaser the materials such as construction equipments, erection tools, and tackles scaffolding etc with the written permission of the GWIL if the contractor fails to remove such materials GWIL to do so then the GWIL shall have the liberty to dispose of such materials and credit the proceeds thereof to the account of the contractor.

9.0 FACILITIES TO BE PROVIDED BY THE GWIL

9.1 SPACE

The contractor shall advise GWIL within fifteen (15) days from the date of acceptance of the letter of intent, about his exact requirements of space for his office, mess rooms, storage area, pre-assembly and fabrication areas, labour colony area, toilets, etc the above requirement shall be reviewed by the GWIL and land if available will be given to the contractor for construction of his temporary structures like office, storage sheds, labour and staff colony and other utilities, etc for his own as well as his sub use. It will not be binding to owner GWIL to spare the land if not available. In that case contractor shall have to make his own arrangements. The material once supplied shall have to be stored and preserved by agency up till the commission Agency may deploy the person to protect the materials supplied by agency at their own cost.

10.0 CONSTRUCTION MANAGERMENTS

10.1 Time is the essence of the contract and the contractor shall be responsible for performance of his works in accordance with the specified construction schedule. If at any time the contractor is falling behind schedule, he shall make necessary action to make good for such delays by increasing his work force or by working overtime or over wise accelerate the progress of the work to comply with the schedule and shall communicate such action in writing to the GWIL satisfying that his action will compensate for the delay . The contractor shall not be allowed any extra compensation for such action.

11.0 CONTRACTOR'S COOPERATION WITH THE GWIL

In case where the performance of the erection work by the contractor the operation of the system facilities of the GWIL such erection work of the contractor shall be scheduled to be performed only in the manner stipulated by GWIL and the same shall be acceptable at all times to the contractor. The GWIL may important such restrictions on the facilities if provided to the contractor such as electricity, water etc as the GWIL

may think fit in the interest of the itself and the contractor shall strictly adhere to such restrictions and cooperate with the GWIL it will be the responsibilities of the contractor to provided all necessary temporary instrumentation and other measuring devices required during the start-up and operation of equipment systems which are erected by him. Before commission of any machine all old lubricants, greases etc shall be thoroughly removed, the part cleaned of all deleterious material and shall be freshly lubricated by sealed lubricants, of exact pacifications.

12.0 COOPERATION WITH OTHER CONSTRUCTIONS & FOR GWIL

The contractor shall agree to cooperative with the GWIL other contractor and consultants of GWIL and freely exchange with them such technical information and economical design features to avoid unnecessary duplication of efforts .The contractor shall attend design coordination meetings at his own cost whenever required.

13.0 FIELD OFFICE RECORDS

- 13.1 The contractor shall maintain at his site office up to date copies of all drawings specifications and other contract documents and any other supplementary data complete with all the latest revisions thereto. The contractor shall also maintain in addition, the continuous records of all changes to the above contract documents, drawings, specifications, supplementary data etc. affected at the field and on completion of his total assignment under the contract shall incorporate all such changes on the drawings and other engineering data to indicate as installed conditions of the equipments furnished and erected under the contract. Such drawings and engineering data shall be submitted to the GWIL in required number of the copies.

14.0 DESIGN COORDINATION

- 14.1 The contractor shall be responsible for the selection and design of appropriate equipments to provide the basic coordinated performance of the entire system They also design requirement are detailed out in technical specifications. The design of various components, sub assemblies and assemblies shall be not got done, such that it facilities easy field assembly and maintenance. All the relating components shall be so selected that the natural frequency of the compact unit is not critical at or close to the operating range of the unit.

15.0 QUALITY ASSURANCE PROGRAMME

To ensure that the equipment and services under scope of this contract whether manufactured or performed within the contractor's work or at his sub contractor's premises or at the owner's site or at any other place of work are in accordance with the specifications. The contractor shall adopt suitable quality assurance programme to such activities at all points, necessary such programme shall be outlined by the contractor and shall be finally

accepted by the purchaser after discussions before the start of contract, and such agreed programme shall form part of the contract.

16.0 DEFECTS IN WORK OF OTHER CONTRACTOR

16.1 The GWIL shall be notified promptly by the contractor of any defects in the other contractor works, the GWIL shall determine the corrective measures if any required to rectify this situation after joint inspection work and such decision by the GWIL shall be binding on the contractor.

17.0 UNFORSEEN WORKING CONDITIONS

17.1 The contractor shall confirm all his field operations to those works which can be performed without subjecting the equipment and materials to adverse effects, during inclement weather conditions, monsoon, storms, etc and during other unfavorable construction condition. No field activities shall be performed by the contractor under conditions which might adversely affect the quality and efficiency thereof, unless special precaution or measures are taken by the contractor in a proper and satisfactory manner in the performance of such works and with the concurrence of the purchaser. Such unfavorable construction conditions will in no way relive the contractor of his responsibility to perform the works as per schedule.

18.0 PROTECTIVE GUARDS.

18.1 Suitable guards shall be provided for protection of personal on all exposed rotating and / or moving machine parts. All such guards with necessary spaces and accessories shall be designed for easy installation and removal for maintenance purposes.

19.0 WELDING

19.1 If the manufacture has special requirement relating to the welding procedures for welds at the terminals of the equipment to procedure procured by the owned separate specifications. The requirement shall be submitted to the GWIL in advance of commencement of erection work.

20.0 NOISE AND VIBRATIONS

20.1 The equipment supplied and erection by the bidder will comply with best design and erection and its working shall within permissible noise and vibration levels.

21.0 EQUIPMENT BASES

21.1 A cast iron or welded steel base plate shall be provided for all rotating equipment which is to be installed on a concrete base unless otherwise agree by the GWIL each base plate shall support the unit and its drive assembly shall be of a neat design with anchoring the units.

22.0 SHAFT ALIGNMENTS

All the shafts of rotating equipment shall be properly aligned to these of the machine equipments to as perfect and accuracy as practicable. The equipment shall be free

from excessive vibration so as to avoid over heating of bearing or other conditions which may tend to shorten the life of the equipment. All bearings shafts and other rotating parts shall be thoroughly cleaned and suitable lubricated before starting.

23.0 DOWELLING

All the drive motors and other equipment shall suitable dowelled after alignment of shaft with tapered machine dowels as per direction of the GWIL.

24.0 PAINTING

All exposed metal parts of the equipments including piping, structures railings etc. Wherever applicable after installation unless otherwise specified shall be surface protected and shall be first painted with at least primer paint used, after thoroughly cleaning all such parts of all dirt, rust Axles greases, oils and other foreign materials by wire brushing, scraping or sand blasting and the same being inspected and approved or sand blasting and the same being inspected approved by the board for painting. Afterwards the above parts shall be finished with two coats of alloyed resin machinery enamel paints The quality of the finished paints shall be as per standards of I.S.I or equivalent and shall be of the colour as approved by the GWIL

25.0 COLOUR CODE FOR PIPE SERVICES

25.1 All pipe services wherever applicable are to be painted accordance with the owner's standard colour scheme by the contractor.

26.0 LUBRICATION

Equipments shall be lubricated by system suitable for duty of the equipment Lubricant level indicators wherever provided shall be furnished and parked to indicate proper levels under both stand steel and operating conditions.

27.0 FIRST FILLING OF CONSUMABLES OIL AND LUBRICANTS:

All the first fill of consumables such as oils, lubricants and essential chemicals etc. which will be required to put the equipment covered under the scope of the specifications into successful trial operation. They shall be furnished by the contractor unless specifically excluded under the in these specification and documents.

CHECKOUT CONTROL SYSTEMS:

After completion of wiring and cable furnished under separate specifications and laid as per the terms noted by the board the contractor shall check out the operation of all control system for the equipments furnished and installed under these specification and documents.

28.0 EQUIPMENT PERFORMANCE GUARANTEE

The performance guarantees of the equipments under the scope of the contract are detailed separately in the technical specifications. These guarantees shall supplement the general performance guarantee provisions covered under general terms and conditions.

29.0 GUARANTEE

In the event of any emergency where in the judgment of the board delay would cause serious loss or damage, repairs or adjustments may be made by the GWIL or a third party chosen by the GWIL without notice to the contractor or by surety. In the event such action is taken by the purchaser the contractors will be notified promptly and he shall assist whenever possible in making the necessary corrections. This shall not extinguish the contractor's liability under the terms and conditions of the contractor.

The cost of any special or general overhaul rendered necessary during the maintenance period due to the defect in the plant or defective work carried out the contractor the same shall be borne by the contractor.

In case of this effective parts which are not repairable at site but are essential for the commercial operation of the equipment, the contractor and the GWIL shall naturally agree to a programme of replacement of renewal which will minimize interruption to the maximum extent, in to operation of the equipment. At the end of guarantee period the contractors liability except for the latest defects in respect of goods supplied by sub contractor to the contractor where a longer guarantee (More than 12 months) is provided by sub - contractors, the owner shall be entitled to the benefit of such longer guarantee. Then provisions contained in this clause will not be applicable.

If the owner has not operated the equipment according to generally approved industrial practices and in accordance with the conditions of operation specified and in accordance the operating manuals, if any.

30.0 RECOMMISSIONING TRIALS - TESTS START - UP

On completion of erection of the equipment and before start up each items of the equipment shall be thoroughly cleaned and then inspected jointly by the GWIL and the contractor for correctness and completion of installation and acceptability for start up, loading to initial pre-commissioning tests at site.

The list of pre-commissioning tests to be performed shall be as mutually agreed and include in the contractor's quality assurance programme. The contractors commissioning / start up board specifically identified as far as possible and the contractor shall be responsible for carrying out all pre-commissioning tests. On completion of inspection checking after pre-commissioning tests are satisfactorily over, the complete shall be placed on initial operation during which period the complete equipment shall be operated integral with sub systems and supporting equipments as complete plant.

31.0 TRIAL OPERATION

The plant shall then be on trial operation during which period all necessary adjustments shall made while operating over the full load-range enabling the plant to be made ready for performance and guarantee tests.

The duration of trial operation of the complete equipment should be One Month. If initial operation or any other duration as may be agreed to between the contractors. The trial operation shall be considered successful provided that each item of equipment can operate continuously at the specified operating characteristics, for the period of trial operation.

For the period of trial operation, the time of operation with any load shall be counted. Minor interruptions not exceeding four (4) hours at a time caused during the continuous operation shall not affect the total during of trial operation.

However, if in the opinion of the, purchaser, the interruption is long, the operation shall be prolonged for the period if interruption. A trial report comprising of observations and recordings of various parameters to be measured in respect of the above trial operation shall be prepared by contractor. This report, besides recording the details of the observation during trial run shall also including the dates of starts and finish of the trial operation and shall be signed by the representative of both the parties.

The report shall have sheets, recording all the details of interruptions occurred adjustment made and any minor repairs done during the trial operation, based on the observation necessary modification/repairs to the plant shall be carried out by the contractor to the full satisfaction of the GWIL, to enable the latter on to accorded permission to carry out performance and guarantee tests on the plant.

32.0 PERFORMANCE AND GUARANTEE TEST

- 32.1 The final test as to the performance and guarantees shall be conducted at site by the GWIL. The contractor's shall make the equipment ready for such tests and assist by the GWIL conducting such tests free of cost, such test shall be commenced after the successful completion of trial operation.
- 32.2 These trends shall be binding on both the parties of the contract to determine compliance of the equipment with the performance guarantee.
- 32.3 The available instrumentation and control equipment will be used during such tests and the GWIL will be calibrate, all such measuring equipment and devices as far as practicable. However, immeasurable parameters shall be taken into account in a reasonable manner by the GWIL, for the requirement of these tests. The tests will be conducted for the specified duty and as near to the specified conditions as practicable. The GWIL will apply proper correction in calculation to take into account condition, which should not correspond to the specified condition.
- 32.4 Any special equipment, tools tackles required for the successful completion of the performance and guarantee tests shall be provided by the contractor, free of cost.

32.5 The guaranteed performance figure of the equipments shall be provided by the contractor during these performance and guarantee cost should the results of these tests show any depressed from the guaranteed values, the contractor shall modify the equipments as required to enable them to meet the guarantees. In such case performance and guarantee tests shall be repeated one month, from the date of equipment is ready for re-tests and all cost for modification including labour materials and the cost of additional testing prove that the equipment meets the guarantees shall be borne by the contractor.

32.6 The specific tests to be conducted on equipments have been brought out in the technical specifications.

32.7 Performance and guarantee tests shall make allowance for instrumentation error as may be decided by the GWIL.

33.0 REGISTRATION AND STATUTORY INSPECTION:

33.1 All registration and statutory inspection fees if any in respect of this work pursuant to this contract shall be to the account of the contractor. However, any registration statutory inspection fees lawfully payable under the provision of statutory laws and its amendments from time to time during erection in respect of the plant equipment ultimately to be owned by the owner shall be to account of the owner. Should any such inspection or registration need to be rearranged due to the fault of the contractor or his sub-contractor the additional fees for such inspection and /or registration shall be borne by the contractor.

34.0 WORKS AND SAFETY REGULATION

34.1 The contractor will notify the GWIL of his intention to bring on the site any equipment or any container with liquid or gaseous fuel or other substance which may create hazard. The GWIL shall have the right to prescribe the conditions for un keep of such hazardous equipments.

Before the contractor connects any electrical appliances to any plug or socket belonging to the other contractor or owner he shall:

- (a) Satisfy the Engineer in charge of GWIL that the appliance is in good working conditions.
- (b) Inform the GWIL of the maximum current rating voltage and phases power factor the appliances.
- (c) Obtain permission of the Board detailing the sockets to which the appliances may be connected.

34.2 The GWIL shall not grant permission to connect until it is satisfied that

- (a) The appliance is in good condition and is fitted with suitable plug
- (b) The appliance is fitted with a suitable cable having two earth conductors, one of which shall be an earthed metal sheet surrounding the cores.

- 34.3 No electrical cable in use by the contractor / GWIL shall be disturbed without prior permission. No weight of any description will be placed on any such cable and no ladder or similar equipment will rest against or be attached to it, under which such equipment or container may be handled and used during the performance of the work and the contractor shall strictly adhere to such instruction. The GWIL shall have the right to inspect any construction plant and to forbid its use if in its opinion it is unsafe. No claims due to such prohibition shall be entertained by the GWIL.
- 34.4 Where it is necessary to provide and / or store petroleum products petroleum mixtures and explosives, the contractor shall be responsible for carrying out such provision and / or storage in petroleum Act explosives Act 1948 and petroleum inspector of Explosives of India. All such storage shall have prior approvals of the GWIL in case any statutory authority the contractor shall be responsible for obtaining the same.
- 35.0 ELECTRICAL SAFETY REGULATIONS:**
- 35.1 In no circumstances shall the contractor interfere with fuse and electrical equipment belonging to the GWIL or other contractors.
- 35.2 No work shall be carried out on any live equipment. The equipment shall be made safe by the GWIL and a permit to work be issued before work is carried out.
- 35.3 The contractor shall employ the necessary number of qualified full time electricians to maintain temporary electrical installation.

GENERAL REQUIREMENTS (ADDITIONAL)

- 1. Employer's Drawings (if any)**
 - 1.1. The drawings listed in the tender document are the Employer's drawings and are provided by the Employer as illustrative of the specification.
 - 1.2. All data and information furnished in the drawings by the Employer is given in good faith but the Employer does not accept the responsibility for the completeness and accuracy thereof. The same shall be verified by the contractor promptly pointing out errors or discrepancies thereof to the Engineer.
- 2. Drawings Furnished by the Employer (if any)**
 - 2.1. The contractor shall carefully check all drawings and / or instructions furnished by the Engineer in charge before commencing any Work, and shall inform the EIC in writing, within a day from the receipt of the same, of any errors or omissions discovered, or of the difficulty to execute any works or part thereof in compliance with these drawings and / or the written instructions received from the EIC. Failing to do this, he shall be liable to execute at his own cost the necessary alterations to any works resulting from these errors or omissions.

- 2.2. The contractor will be furnished with 2 copies of any such drawings prepared by the Engineer. The contractor will also be furnished with two copies of all instructions as may be issued by the Engineer. One copy of all such drawings and instructions issued to the contractor shall be kept in his office at the site. No drawing or instruction shall be considered valid unless it has been signed by the Engineer.

3. Drawing Sheet Format

- 3.1. All drawings provided by the contractor shall be on standard size sheets, prepared on computer with Auto Cad 14 and shall show the following particulars in a title block located in the lower right hand corner, in addition to the name of contractor and equipment manufacturer, date, scale, drawing number, revision number (R0 for drawings submitted initially, R1, R2, etc. for drawings submitted subsequently) and title:

Gujarat Water Infrastructure Limited / Name of Project: _____

A blank space of 90 mm x 100 mm shall be provided for the Engineer's approval stamp and provision shall be made for details of revisions to be recorded.

- 3.2. All drawings submitted by the bidder / contractor shall use the English language and preferably SI units. All drawings shall be clearly and fully cross referenced to the other drawings as relevant.

4. Tender / Contract Drawings

- 4.1. Drawings submitted by the bidder shall show all the essential items of the plant offered together with sufficient details to enable the general arrangement of the Plant to be determined.

- 4.2. The outline dimensional drawings submitted by the contractor shall include the following in addition to overall dimensions:

Parameters of equipment

Load details

Support details

Foundation pocket details

- 4.3. The drawings to be provided by the Bidder / Contractor shall include the following, but shall not be limited to those listed:

(* Indicates the drawings/documents to be submitted)

Sr. No.	Description	To be submitted with the Tender	To be submitted after the award of the Contract
	Outline Dimensional Drawing		

Sr. No.	Description	To be submitted with the Tender	To be submitted after the award of the Contract
.1	Pumping Machinery (VT/ SCF/HSCF/ ES)	*	*
.2	Induction motor with separate terminal box for:		
(a)	Line / Neutral side terminals with phase segregation	*	
(b)	Resistance temperature detectors		*
Cross Sectional Drawing with Materials of Construction			
.1	Pump	*	*
.2	Motor for above	*	*
.3	Pump Performance curves at rated RPM : Q Vs H, P, η & NPSH	*	
.4	Q Vs H curves super-imposed on system resistance curves	*	
.5	Performance Test Records of 2 pumps (same as the offered model)	*	
.6	Pump ISO efficiency Curve	*	
Motor Curves			
.7	Starting Current Vs time		*
.8	Characteristics under cold and hot conditions		*

5. Submission and Approval of Drawings

- 5.1. The following shall be the procedure for submission and approval of drawings:
- 5.1.1. The contractor shall submit 3 copies of the drawings to the Employer. All the drawings are to be signed by the contractor or his authorized representatives
- 5.1.2. The Engineer in charge's (EIC) representative will review the drawings and, if found fit for approval, the Employer will return 2 copies to the contractor duly approved.
- 5.1.3. In case the drawings / documents are not fit for approval but worth for review, the EIC's representative will mark the comments on the drawings and return 2 copies to the contractor. In such case, the contractor shall resubmit the revised drawings within two weeks as per sub clause 5.1.1 above and the same shall be repeated till the drawings are finally approved as per sub clause 5.1.2 above.
- 5.1.4. If the submitted drawings / documents are not worth for review, the contractor will be informed accordingly.

- 5.1.5. On receipt of the approved drawings as per sub clause 5.1.2 above, the contractor shall submit floppy and documents to the employer.
- 5.1.6. After tests on completion, the contractor shall submit, within 15 days of the conclusion of the tests, CD's of the "As Built Drawings" to the Employer.
- 5.2. When the drawings are received by the EIC's representative after revision by the contractor, he will only review the revision made and hence the contractor shall carefully identify all the revised details / dimensions and also describe the revisions in the revision block.
- 5.3. No drawings, with corrections made after taking the prints, will be accepted.
- 5.4. Approval of drawings by the Engineer shall not relieve the contractor of his responsibility in terms of the contract.
- 6. Operation and Maintenance Manuals**
- 6.1. The operation and maintenance manuals shall be arranged to provide separate volumes for each principal section of the Works and they shall relate to as built conditions and shall include all necessary drawings and diagrams for a proper understanding of the works.
- 6.2. The operation and maintenance manual shall be approved in draft form initially prior to commencement of erection by the EIC's representative and shall cover all items of the Works. For this purpose, three draft copies shall be submitted to the EIC's representative. A mere collection of manufacturers' descriptive leaflets will not be acceptable in satisfaction of this clause. The operation and maintenance manual shall comprise both operating instructions and maintenance instructions.
- 6.3. The manuals shall include, but not be limited to the following information:
 - 6.3.1. Descriptive overview of the whole of the works.
 - 6.3.2. Descriptions of all systems installed, including mechanical, electrical, instrumentation, control systems with relevant design and operating parameters.
 - 6.3.3. Descriptions of all equipment supplied including manufacturer's leaflets, which shall be scheduled for easy reference.
 - 6.3.4. Schedules and manufacturer's catalogues for all equipment supplied, giving duties, electrical load, etc.
 - 6.3.5. Schedules of all equipment suppliers (and their local agents) including names, addresses, telephone & facsimile numbers and e-mail ID.
 - 6.3.6. Start up, operation and shut down instructions for all parts of the works. These shall include step by step directions on setting the plant to work listing all adjustments and settings necessary for the current functioning of the plant.
 - 6.3.7. Instructions on monitoring of plant performance and sample log sheets for each plant item, to be filled by operators on a routine basis.

- 6.3.8. “Dos” and “Don’ts” in plant operation: Operator’s attention shall be drawn to all operations considered to be dangerous to operators or likely to cause damage to the plant.
- 6.3.9. Procedures to deal with breakdown and emergencies
- 6.3.10. Safety requirements
- 6.3.11. Checking, testing and replacement procedures to be carried out on all plant items on a daily weekly and monthly basis or at longer intervals to ensure trouble free operation. Full maintenance instructions for all equipment including planned maintenance schedules or charts giving daily, weekly, monthly, quarterly, half yearly, annual overhaul instructions together with recommended lubricants and spares. These shall also include details of routine maintenance work that will be within the competence of the normal maintenance staff and notification of maintenance work that will have to be done by the manufacturer, his agent or other specialist operator.
- 6.3.12. Fault locations and remedy charts to facilitate tracing the cause of malfunctions or break down and correcting faults.
- 6.3.13. Complete list of recommended lubricants and lubrications charts.
- 6.3.14. A ‘spares schedule’ which shall consist of a complete list of item wise spares for all plant items with ordering references and part numbers.
- 6.3.15. A complete list of manufacturer’s instructions for operation and maintenance of all bought out equipment. The list shall be tabulated in alphabetical order giving the name of supplier / manufacture, identification of the Plant item giving the model number and the literature provided including instruction leaflets and drawing numbers.
- 6.3.16. Step by step procedure for the dismantling, repair and re assembly of all items of equipment.
- 6.3.17. Part list and drawings or exploded diagrams for each item of plant with construction particulars, materials of construction, mating components, clearances and tolerances, maximum wear permitted before replacements are to be done, etc
- 6.3.18. Record drawings of all systems installed, including general arrangements, conduit and wiring trunking systems, wiring diagrams, control schematics and valve charts, etc., to a reduced scale.
- 6.4. The contractor shall furnish 3 copies of the Operation and Maintenance Manual for each station. Each volume shall be durable and permanently bound within a stiff binder of a design to be approved by the Employer. They shall permit the subsequent incorporation of revisions to be necessary during the defect liability period.
- 7. Protection and Packing for Transportation**
- 7.1. Before any plant is dispatched from manufacturer’s works it shall be properly prepared and packed and the contractor shall give the Employer at least 14 days notice that these preparations are to commence.

- 7.2. Prior to dispatch the plant shall be adequately protected by painting or by other approved means for the whole period of transit, storage and erection, against corrosion and incidental damage, including the effects of vermin, sunlight rain, high temperatures and humid atmospheres. The contractor shall be responsible for the plant being so packed and / or protected as to ensure that it reaches the Site intact and undamaged. The plant shall be packed to withstand rough handling in transit and all packages shall be suitable for storage including possible delays in transit.
- 7.3. The contractor shall be deemed to have included in the schedule of prices for all materials and packing cases necessary for the safe package, conveyance and delivery and storage of the plant with all protective and preservation measures.
- 7.4. Cases containing rubber rings, bolts and other small items shall not normally weigh more than 50 kg gross per case. No one package or bundle shall contain items of plant intended for incorporation in more than one section of the works. All items of plant shall be clearly marked for identification against the packing list.
- 7.5. Eye bolts, lifting hooks and brackets shall be provided for lifting the boxes, crates and packages. Every crate or package shall contain a packing list in a waterproof envelope. A duplicate copy of the packing list shall be sent by post to the EIC's representative at site.
- 7.6. All crates, packages, etc. shall be clearly marked with a waterproof material to show the weight and where the slings should be attached, and shall also have an indelible identification mark relating them to the packing lists. Packing cases shall be nonreturnable. Contractor shall have to clear the site including packing material.
- 7.7. Electrical equipment shall be enclosed in sealed air tight package with hygroscopic material, before being placed in packing cases on shock absorbent materials and secured by means of battens.

8. Delivery, Unloading and Storing at Site

- 8.1. The Contractor shall be responsible for checking all materials delivered to Site and shall keep the EIC or his representative fully informed of the state of deliveries. The contractor shall carry out, at his cost, all instructions of EIC or his representative for proper unloading, preservation, maintenance, storage and security of materials delivered to site until he fulfills all his obligations under the contract.
- 8.2. The contractor shall erect and maintain on the Site any temporary storage facility as required and approved by the EIC. If built up shed or area is provided by the Employer depending upon availability, the contractor shall have to pay rent as finalised by the EIC.
- 8.3. Multiple handling and movement of materials during storage and retrieval shall be avoided.

MATERIALS AND WORKMANSHIP

1. Introduction

- 1.1. This part of the specification sets out the general standards of materials to be supplied and the workmanship required to be ensured by the contractor. All component parts of the

Works shall, unless otherwise specified, comply with the provisions of this part or be subject to the approval of the Employer. Particular attention shall be paid to a neat, orderly and well arranged installation carried out in a methodical competent manner.

2. Reference Specifications and Standards

- 2.1. Where reference is made in the Specification to a British Standard Specification (hereinafter abbreviated to 'B.S') issued by the British Standards Institution of 2, Park street, London W.1., or to an Indian Standard Specification (I.S.) issued by the Bureau of Indian Standards, (earlier known as Indian Standard Institution), Manak Bhavan, 9 Bahadur shah Zafar Marg, New Delhi 110 002, or American Society for Testing and materials (ASTM) issued by ASTM 1916 Race Street, Philadelphia, P.A., 19103, U.S.A. or American national Standards Institute (ANSI) issued by ANSI 1430, Broadway, New York, N.Y., 10018, U.S.A. or Japanese Industrial Standards (JIS) issued by Japanese Standards Association, 4-1-24, Akasaka, Minato-Ku, Tokyo 107, Japan or to any other equivalent Standard it shall be to the latest revision of that Standard at the tender opening date.
- 2.2. The contractor may propose at no extra cost to the Employer, the use of any relevant authoritative internationally recognized Reference Standard.
- 2.3. All details, materials and equipment supplied and workmanship performed shall comply with the specified Standards. If bidder offers equipment to other Standards, the equipment / material should be equal or superior to those specified and full details of the difference shall be supplied.
- 2.4. In the event of conflict between this specification and the codes for equipment, provisions of this specification shall govern. Certain specifications issued by national or other widely recognised bodies are referred to in this specification. In referring to the Standard Specifications the following abbreviations are used:

IS	:	Indian Standard
ANSI	:	American National Standards Institute
API	:	American Petroleum Institute
ASME	:	American Society of Mechanical Engineers
ASTM	:	American Society of Testing and Materials
AWS	:	American Welding Society
AWWA	:	American Water Works Association
ISO	:	International Organisation for Standardisation
DIN	:	Deutsches Institute fur Normung
BS	:	British Standard
IEC	:	International Electrotechnical Commission

IEE	:	Institution of Electrical Engineers
IEEE	:	Institute of Electrical and Electronic Engineers
NEMA	:	National Electrical Manufacturers Association
AGMA	:	American Gear Manufacturer's Association
HIS	:	Hydraulic Institute Standard

3. Materials General

- 3.1. All materials incorporated in the works shall be the most suitable for the duty concerned and shall be new and of reputed make / approved quality, free from imperfections and selected for long life and minimum maintenance. Non destructive tests, if called for in the Specification, shall be carried out. All submerged moving parts of the plant, or shafts and spindles or faces etc. in contact with them shall be of corrosion resistant materials. All parts in direct contact with various chemicals, shall be completely resistant to corrosion, or abrasion by these chemicals, and shall maintain their properties without aging due to the passages of time, exposure to light or any other cause.

4. Workmanship General

- 4.1. Workmanship and general finish shall be of first class quality and in accordance with best workshop practice.
- 4.2. All similar items of the plant and their component parts shall be completely interchangeable. Spare parts shall be manufactured from the same materials as the originals and shall fit all similar items. Machining fits on renewable parts shall be accurate and to specified tolerances so that replacements can be readily installed. All equipment shall operate without excessive vibration and with minimum noise. All revolving parts shall be truly balanced both statically and dynamically so that when running at normal speeds at any load up to the maximum there shall be no vibration due to lack of balance.
- 4.3. All parts which can be worn or damaged by dust shall be totally enclosed in dust proof housings. All materials incorporated in the works shall be the most suitable for the duty concerned, free from imperfections and selected for long life and minimum maintenance. All necessary accessories required for satisfactory and safe operation of the plant shall be supplied by the contractor unless it is specifically excluded from his scope. Suitable provision by means of eyebolts or other means are to be provided to facilitate handling of all items that are too heavy or bulky for lifting and carrying by two men.
- 4.4. If, after installation, the operation or use of the materials or equipment furnished by the contractor proves to be unsatisfactory. The Employer shall have the right to operate or use such materials or equipment until correction of defects, errors or omissions, by repair or by partial or complete replacement, can be made without interfering with the plant operations. Except for any warranty provided for elsewhere in this contract or unless otherwise agreed upon in advance, the period of such operation or use, pending correction of defects, will not exceed 1 year.

5. Welding

- 5.1. Welding shall comply with the latest revision of the BS 5135 Code.
- 5.2. Welders shall be qualified in accordance with the requirement of the appropriate section of BS 4871. The Engineer shall have the right to call for further qualification from time to time from any welder who in the opinion of the EIC does not produce weld in accordance with the qualification. Each welder shall be assigned a number and letter. Each welded end shall clearly be identified as to its welder marking the welder's code adjacent to the welds. A record chart shall be maintained for each welder showing the procedures, for which he has qualified, the date of such qualification, the type of defects produced and their frequency. The EIC shall disqualify the welder whose work requires a disproportionate amount of repairs. All procedures where required shall be qualified as per BS EN 283-3.
- 5.3. Inspection and quality of surveillance shall not be limited to the examination of finished welds. The techniques employed shall be based on methods which are known to produce good results and which have been verified at Site by actual demonstration.
- 5.4. Haphazard striking of the electrodes for establishing an arc shall not be permitted. The arc shall be struck either on the joint or on a starting tag. The starting tag shall be of the same material or a material compatible with the base metal being welded. In case of any inadvertent strike on place other than the welding, the area affected shall be ground flushed and examined by liquid penetration method.
- 5.5. Generally, a stringer bead technique shall be used with a slight oscillation of necessary to avoid slag and to minimise the number of beads needed to fill exceed 3 times the wire diameter. Vertical welds shall be made in upward direction. For all pipes above 300 mm dia., welding shall be done whenever possible, by 2 welders working simultaneously along both sides of the pipe.
- 5.6. The root pass shall have less than 1.5 mm internal reinforcement. Defects like icicles, burn through and excessive "such back" etc. shall be cause for rejection of welds.
- 5.7. Final welds shall be suitable for appropriate fabrication of the non-destructive examination of the weld. If grinding is necessary, the weld shall be blended into the parent metal without gouging or thinning of the parent metal in any way. Uneven and excessive grinding may be a cause for rejection. Fillet weld shall preferably be convex and free from undercutting and overlap at the toe of weld. Convexity and concavity shall not exceed 1.5 mm. The leg lengths shall not exceed the specified size by more than 1.5 mm.
- 5.8. All attachments such as lugs, brackets and other non pressure parts shall also be done by qualified welders in accordance with the design details and materials specifications. Temporary attachments shall be removed in a manner that will not damage the parent metal. Areas of temporary attachments shall be dressed smooth and examined by ultrasonic or liquid penetration methods.

5.9. All tack welds shall be made using qualified procedure and welders, the number of size of tack welds shall be kept as small as to consist of adequate strength and joint alignments. All tack welds shall be examined visually for defects and if found defective shall be completely removed. As welding proceeds, tack welds shall be either removed completely or shall be properly prepared by grinding or filling their starting ends so that they may be satisfactorily incorporated in the welds. Unacceptable defects shall be removed by grinding machine or chipping or gouging. Flame gouging may be permitted provided gouged surfaces are ground at least by 1.0 mm below the deepest indentation.

5.10. All weld repairs shall be carried out using the approved welding procedures and welders. Re welded areas shall be reexamined by the methods specified for the original welds and repair procedures shall be duly qualified by the EIC's representative.

6. Pre heating and Post heating Treatment

6.1. Pre heating and post heating treatment shall conform to the relevant application codes. Preheating not exceeding 121⁰ C for all carbon steel construction above 25 mm thickness would be mandatory. Such pre heating would be maintained during flame cutting, flame or arc gouging, welding and repairs and may be done by gas heating by gas torches / gas rings with neutral flame. The temperature shall be checked by temperature indicating crayons. However, such pre heating will not be necessary for welds less than 6 mm size. In large diameter pipe fabricated out of plate materials, production control test plates in accordance with the BS 4870 part 1 Table 6 to represent 30 % of the long seams and each welder's performance would be mandatory.

7. Electrodes

7.1. All electrodes shall be stored in their original sealed containers under dry conditions. Electrodes shall remain identified until consumed. All electrodes shall be dried before use. Drying ovens shall be provided in work areas for drying purposes. Electrodes withdrawn from oven shall be promptly used and excess unused electrodes shall be promptly returned to oven.

8. Examination / NDT / Radiography

8.1. The various stages of examination and types shall be as stipulated in the respective fabrication Codes. Radiographic examination shall be carried out as per provisions of BS 2600 or BS 2910. Ultrasonic tests where called for shall be carried out as per provisions of BS 3926, magnetic particle tests shall be carried out as per BS 6072. Liquid penetration tests shall be carried out as per BS 6443.

9. Stainless Steel Welding

9.1. All welding consumable such as electrodes, filler weirs, argon gas for shielding and purging shall be of high quality and the proposed brand shall be furnished for approval of the EIC. Weld deposits shall have similar or higher physical properties and similar chemical composition to the members joined.

- 9.2. All electrodes shall be purchased in sealed containers only and stored in their packing intact. The packets opened shall be consumed as early as possible. The electrodes removed from the containers shall be kept in holding ovens at temperatures recommended by electrode manufacturer. Special care shall be taken in avoiding mixing of electrodes in the oven. The electrodes and filling wires shall be free from rust, oil, grease, earth and other foreign matter.
- 9.3. Argon gas with purity 99.5 % shall be used for shielding and purging. The purity of gas shall be certified by the gas manufacturers.
- 9.4. Non destructive examination of the welds shall be carried out to ensure quality of weld.
- 9.5. The electric current for welding shall be direct current, straight polarity (electrode negative). The welding current shall be kept minimum possible to ensure minimum heat affected zone in the parent material. Other side of the weld joint shall be periodically flushed with argon gas.

10. Castings

- 10.1. Cast iron shall be of standard grey close grained quality. The structure of the castings shall be homogeneous and free from non metallic inclusions and other injurious defects. All surfaces of castings which are not machined shall be smooth and shall be carefully fettled to remove all foundry irregularities.
- 10.2. Minor defects in depth not exceeding 12.5 percent of total metal thickness and which will not ultimately affect the strength and serviceability of the casting may be repaired by approved welding techniques. The EIC shall be notified of large defects and no repair welding of such defects shall be carried out without prior approval of the EIC. If the removal of metal for repair should reduce the stress resisting cross section of the casting by more than 25 percent, or to such an extent that the computed stress in the remaining metal exceeds the allowable stress by more than 25 percent, then casting shall be rejected. Test coupons cast simultaneously with the main castings shall be identified to check physical, chemical analysis of casting. Major defects on casting are not acceptable. Castings repaired by welding for minor defects shall be stress relieved after such welding. Non destructive tests as directed by the EIC will be required for any casting containing defects whose extent cannot otherwise be judged, or to determine where repair welds have been properly made.

11. Forging

- 11.1. All major stress bearing forging shall be made to a Standard specifications. Forging shall be subjected to magnetic particle testing or dye penetration test at the areas of fillets and change in section. The testing shall be conducted after rough machining (10 microns). Any defect which will not machine out during the final machining, will be gouged out fully, inspected by dye penetration or magnetic particle inspection to ensure that the defect is fully removed and repaired using an approved repair procedure. Any indication, which proves to penetrate deeper than 2.5 % of the finished thickness of the component, shall be

reported to the EIC giving the details like location, length, width and depth. For the magnetic particle inspection the choice of wet or dry particles shall be at the Contractor's discretion.

- 11.2. All forging shall be demagnetized after test and shall be heat treated for the relief of residual stresses.

12. Design Life

- 12.1. The works as a whole shall be new, of sound workmanship, robustly designed for a long reliable operating life and shall be capable of 24 hours per day continuous operation for prolonged period in the climatic and working conditions prevailing at the Site, and with the minimum of maintenance. Particular attention shall be given to temperature changes, the stability of paint finish for high temperatures, the rating of engines, electrical machinery, thermal overload services, cooling systems and the choice of lubricants for possible high and prolonged operating temperatures. The contractor shall be called upon to demonstrate this for any component part either by service records, or evidence of similar equipment already installed elsewhere or relevant type tests. Routine maintenance and repair shall as far as possible not requires the services of highly skilled personnel.
- 12.2. The plant shall be designed to provide easy access to and replacement of component parts which are subject to wear, without the need to replace whole units. No parts in contact with water shall have a life from new to replacement or repair of less than five years.
- 12.3. Design features shall include the protection of plant against damage caused by vermin, dirt, dust and dampness and to reduce risk of fire. Plant shall operate without undue vibration, and parts shall be designed to withstand the maximum stresses under the most severe condition of normal service. Materials shall have a high resistance to change in their properties due to the passage of time, exposure to light, temperature and any other cause which may have a detrimental effect upon the performance or life of the Works.
- 12.4. Plant located outside lockable areas / building shall have additional features to prevent un authorized operation.

13. Lubrication

- 13.1. A complete schedule of recommended oils and other lubricants shall be furnished by the contractor. The number of different types of lubricants shall be kept to a minimum. The schedule and the name of the supplier of the lubricants shall be submitted to the EIC.
- 13.2. Contractor shall indicate indigenously available equivalent lubricants with complete specification, to enable the Employer to arrange for regular supply.
- 13.3. Where lubrication is effected by means of grease, preference shall be given to a pressure system which does not require frequent adjustment or recharging. Frequent, for this purpose, means more than once in a month and grease systems having shorter periods between greasing should be avoided. Where necessary for accessibility grease nipples shall be placed at the end of the extension piping, and, when a number of such points can be

grouped conveniently, the nipples shall be brought to a battery plate mounted in a convenient position. All grease nipples shall be of the same size and type for every part of the plant. Arrangements shall be provided to prevent bearings being overfilled with either grease or oil.

- 13.4. Where more than one type of special grease is required a grease gun for each special type shall be supplied and permanently labeled.
- 13.5. Oil containers shall be supplied complete with oil level indicators of the sight glass type, or where this is not practicable, with dipsticks. The indicators shall show the level at all temperatures likely to be experienced in service. The levels shall be clearly visible in the sight glass type from the normal access floor to the particular item of Plant and they shall be easily dismantled for cleaning. All sight glasses shall be firmly held and enclosed in metal protection in such manner that they cannot be accidentally dislodged.
- 13.6. All lubrication systems shall be designed so as not to cause a fire or pollution hazard and particular care shall be taken to prevent leakage of lubricants and to avoid leaking lubricants coming into contact with any electrical equipment, heated surfaces or any other potential source of fire.

14. Name Plate

- 14.1. Each item of the plant shall have permanently attached to it in a conspicuous position, a nameplate and rating plate. Upon these shall be engraved or stamped, the manufacturer's name, type and serial number of plant, details of the loading and duty at which the item of plant has been designed to operate, and such diagrams as may be required by the EIC. All indicating and operating devices shall have securely attached to them or marked upon them designations as to their function and proper manner of use.
- 14.2. Name plates, rating plates and labels shall be of a non-flame propagating materials, either non hygroscopic or transparent plastic with engraved lettering of a contrasting colour. Fixing shall be by means of non corrosive screws, drive rivets or adhesives shall not be used.
- 14.3. Warning labels shall be provided where necessary to warn of dangerous circumstances or substances. Inscriptions or graphic symbols shall be black on a yellow background.
- 14.4. Instruction labels shall be provided where safety procedures such as wearing of protective clothing are essential to protect personnel from hazardous or potentially hazardous conditions. These labels shall have inscriptions or graphic symbols in white on a blue background.

15. Nuts, Bolts, Studs and Washers

- 15.1. Nuts, bolts, studs and washers for incorporation in the plant shall conform to the requirements of the appropriate standard. Nuts and bolts shall be of the best quality of specified grade, machined on the shank and under the head and nut

- 15.2. Fitted bolts shall be a light driving fit in the reamed holes they occupy, shall have the screwed portion of such a diameter that it will not be damaged in driving and shall be marked in a conspicuous position to ensure correct assembly at site.
- 15.3. Washers, locking devices and anti vibration arrangements shall be provided where necessary. Jointing hardware for the entire Plant shall be provided with sufficient spares to cater for site losses.
- 15.4. Where bolts pass through structural members taper washers shall be fitted, where necessary, to ensure that no bending stress is caused in the bolt. Where there is a risk of corrosion, bolts, nuts and studs shall be designed so that the maximum stress does not exceed half the yield stress of the material under any conditions. All bolts, nuts and washers which are subject to frequent adjustment or removal in the course of maintenance and repair shall be made of nickel bearing stainless steel.
- 15.5. The contractor shall supply all holding down, alignment and leveling bolts complete with anchorages, nuts, washers and packing required to attach the plant to its foundations, and all bed plates, frames and other structural parts necessary to spread the loads transmitted by the plant to concrete foundations without exceeding the design stresses.
- 16. Allowance for Wastage**
- 16.1. The contractor shall supply reasonable excess quantities to cover wastage of those consumable which will be normally subject to waste during erection, commissioning and setting to Work.
- 17. Painting - General**
- 17.1. The contractor shall be responsible for the cleaning, preparation for painting, and priming or otherwise protecting, as specified, all parts of the plant at the place of manufacture prior to packing.
- 17.2. Parts may be cleaned but surface defects may not be filled in before testing at the manufacturer's works. Parts subject to hydraulic test shall be tested before any surface treatment. After test, all surfaces shall be thoroughly cleaned and dried out, if necessary by washing with an approved de-watering fluid prior to surface treatment. Except where the specification provides to the contrary all painting materials shall be applied in strict accordance with the paint manufacturer's instructions.
- 17.3. All protective coatings shall be suitable for use in warm humid climates. All primers, under coats and finishes shall be applied by brush or airless spray, except where otherwise specified. Consecutive coats shall be in distinct but appropriate shades. All paints shall be supplied from the store to the painters, ready for application, and addition of thinners or any other material shall be prohibited.
- 18. Painting at Place of Manufacture**
- 18.1. Steel and cast iron parts shall be sand blasted to near white cleaning before painting. Edges, sharp covers etc. shall be ground to a curve before sand blasting. A primer coat of

a zinc rich epoxy resin based coating with at least 75 microns dry film thickness is to be provided. In addition the parts are to be provided with adequate number of coats of coal tar epoxy polyamine coating to a dry film thickness of 175 microns including primer coating.

19. Painting at Site

- 19.1. Immediately on arrival at the site, all items of plant shall be examined for damage to the paint coat applied at the manufacturer's works, and any damaged portions shall be cleaned down to the bare metal, all rust removed, and the paint coat made good with similar paint.
- 19.2. After erection, such items which are not finish painted shall be done so and, items that have been finish painted at the manufacturer's works shall be touched up for any damaged paint work. For finish painting, two coats of synthetic enamel conforming to IS: 2932 shall be applied. Dry film thickness of each coat shall be at least 25 microns.
- 19.3. The dry paint film thickness shall be measured by Electrometer or other instruments approved by the Employer. In order to obtain the dry film thickness specified, the contractor shall ensure that the coverage rate given by the paint manufacturer will enable this thickness to be obtained. Strength of adhesion shall be measured with an adhesion tester and this value shall not be less than 10 kg/cm². Painted fabricated steel work which is to be stored prior to erection shall be kept clear of the ground and shall be laid out or stacked in an orderly manner that will ensure that no water or dirt can accumulate on the surface. Suitable packing shall be laid between the stacked materials. Where cover is provided, it shall be ventilated.

20. Noise and Vibration

- 20.1. The Contractor shall provide a quiet installation. All items of plant and equipment shall be carefully chosen with a view to minimizing sound levels.
- 20.2. The Contractor shall provide and fix all material for the prevention of transmission of noise and vibration through the structure. Where appropriate all fans, A/C package unit, compressors and other motif plant shall be mounted on resilient mountings. All rotating plant shall be statically and dynamically balanced.

21. Galvanizing

- 21.1. Wherever galvanizing has been specified the hot dip process shall be used. The galvanized coating shall be of uniform thickness. Weight of zinc coatings for various applications shall not be less than those indicated below:

a) Fabricated steel

- | | | |
|----|---------------------------------------------------|-----------------|
| i | Thickness less than 2 mm but not less than 1.2 mm | 340 gms / sq mm |
| ii | Thickness 2 mm and above | 460 gms / sq mm |

b) Fasteners

- | | | |
|----|------------------------|-----------------|
| i | Up to nominal size M10 | 270 gms / sq mm |
| ii | Over M10 | 300 gms / sq mm |

21.2. Galvanizing shall be carried out after all drilling, punching, cutting, bending and welding operations have been carried out. Burrs shall be removed before galvanizing. Any Site modification of galvanized parts should be covered well by zinc rich primer and aluminum paint.

22. Support for Pipe work & Valves

22.1. All necessary supports, saddles, slings, fixing bolts & foundation bolts shall be supplied to support the pipe work. Valve and other equipments mounted in the pipe work shall be supported independent of the pipes to which they connect.

DETAILED TECHNICAL SPECIFICATIONS

PART I: MECHANICAL

DRIVE MOTOR FOR HSCF PUMP

Design Requirements

- The horizontal solid shaft squirrel cage induction motors connected to the HSCF pump sets shall be suitable for available power supply. The motors shall generally conforming to latest revision of IS 12615 / IEC 60034 with latest national & international code of practices.
- The motors shall generally conform to following IS and / or relevant equivalent internationally approved standards. Additionally the specific requirements mentioned in the following clauses shall also be met.

IEC 60034-1	Rotating electrical machines
IS 12615 (2011)	Energy Efficient Induction Motor - Three Phase Squirrel Cage
IS 325 (1996)	Three phase induction motors
IS 900 (1992)	Code of practice for installation & maintenance of induction motors
IS 1231 (1974)	Dimensions of three phase foot mounted AC induction motors
IS 4029 (1967)	Guide for testing three phase induction motors
IS 4691 (1985)	Degree of protection provided by enclosures for rotating electrical machinery
IS 4889 (1968)	Methods of determination of efficiency of rotating electrical machines
IS 6362 (1971)	Designation of methods of cooling for rotating electrical machines
IS 7538 (1975)	Three phase squirrel cage induction motors for centrifugal pumps for agricultural applications
IS 7816 (1975)	Guide for testing insulation resistance of rotating machines
IS 8789 (1978)	Value of performance characteristics for three phase induction motors.
IS 12065 (1987)	Permissible limits of noise levels for rotating electrical machines
IS 12075 (1986)	Mechanical vibration of rotating electrical machines, measurement, evaluation & limits of vibration severity

Performance and Characteristics

- Motors shall be capable of giving rated output without reduction in the expected life span when operated continuously under the following supply conditions:
 - a) Variation in supply voltage ±10 %
 - b) Variation in supply frequency + 5 %
 - c) Combined voltage and frequency variation ± 10 %
- Drive motors shall be suitable for FCMA soft starter panel or as indicated in the contract.
- Drive motors shall be suitable for fitting with existing pump base frame & Coupling. If pump-motor new coupling required, it should be provided by contractor at no extra cost.
- Motors shall be suitable of starting and accelerating the load with the applicable method of starting, without exceeding acceptable winding temperatures, when the supply voltage is 85% of the rated motor voltage.
- The locked rotor current of the motor shall not exceed 600% of full load current (subject to tolerance as per the applicable standard).

- Motors shall be designed to withstand 120% of rated speed for two minutes without any mechanical damage, in either direction of rotation.
- Stator leads shall be brought to the terminal box as insulated cable through a suitable barrier and terminated in clamp type terminals.

The Power rating of the motor shall be the larger of the following:

- Reserve power margin as tabulated in table-I (clause 3.5) of the power input to the pump at duty point at a speed corresponding to the frequency of 50 Hz.
- 1.05 times Maximum power (Pmax) input while operating solo or in parallel within maximum and minimum system resistances corresponding to the speed at 49 Hz.
- Rating of motor shall be suitable to cover load for entire operating range (preferred / recommended area of operation i. e. - 30 % to + 20 % of design flow rate) of pump model offered with minimum rating of kW.
- Rating of motor shall be suitable to cover load for entire operating range) of pump model offered with minimum rating of kW in case of pumps in parallel operation. In this case operating zone shall mean from shut off to run out position.
- Minimum rating as well efficiency at full working load of the motor shall not be less than prescribed rating in data sheet.
- The type test of required rating (s) of motor (s) carried out by NABL approved lab / CPRI / ERDA are to be produced with QAP and / or at the time of inspection without fail.

Insulation

- Any joints in the motor insulation such as at coil connections or between slot and winding sections, shall have strength equivalent to that of slot sections of the coil. The insulation shall be given tropical and fungicidal treatment for successful operation of the motor in hot, humid and tropical climate. The motors shall be provided with class F insulation with temperature rise limited to that of class B insulation.
- Motors shall be given power house treatment. This comprises an additional treatment to the winding over and above the normal specified treatment. After the coils are placed in slots and all connections have been made, the entire motor assembly shall be impregnated by completely submerging in suitable insulating compound or varnish followed by proper baking. At least three such submersions and bakings shall be applied to the assembly.

Constructional Features

- The motor construction shall be suitable for easy disassembly and reassembly. The enclosure shall be sturdy and shall permit easy removal of any part of the motor for inspection and repair.
- Motors weighing more than 25 kg shall be provided with eyebolts, lugs or other means to facilitate safe lifting.
- The rotor bars shall not be insulated in the slot portion between the iron core laminations for squirrel cage motors.
- In case of prime mover of HSCF pump horizontally foot mounted design shall be required.

Terminal Box

- Terminal boxes shall be of weather proof construction designed for outdoor service. To eliminate entry to dust and water, gaskets of neoprene or approved equivalent shall be provided at cover joints and between box and motor frame. It shall be suitable for bottom entry of cables. It shall be capable of being turned through 360 degrees in steps of 90 degrees.
- The terminals shall be of the stud type with necessary plain washers, spring washers and check-nuts. They shall be designed for the current carrying capacity and shall ensure ample phase to phase and phase to ground clearances. Suitable cable glands and cable lugs shall be supplied to match specified cables.

Paint and Finish

- All motor parts exposed directly to atmosphere shall be finished and painted to produce a neat and durable surface which would prevent rusting and corrosion. The equipment shall be thoroughly degreased, all rust, sharp edges and scale removed and treated with one coat of primer and finished with two coats of grey enamel paint.

Heating during Idle Periods

- Motors rated above 30 kW shall have space heaters suitable for 240V, three phase, 50 Hz, AC supply. Space heaters shall have adequate capacity to maintain motor internal temperature above dew point to prevent moisture condensation during idle period. The space heaters shall be placed in easily accessible positions in the lowest part of the motor frame.

Accessories

- Two independent earthing points shall be provided on opposite sides of the motor, for bolted connections. These earthing points shall be in addition to earthing stud provided in the terminal box.
- Motor shall have Resistance Temperature Detectors (PT100, Simplex type) embedded in stator windings, DE/ NDE bearings (2 nos per winding & 1 no per bearing) to detect overheating & trip the motor from control panel in the event of the temperature exceeding safe operating limit. A Temperature Scanner, having minimum 12 channels with necessary relay outputs, for each motor shall be provided.

Note: Bidders has to enclose confirmation as regards to efficiency quoted, from original manufacturing along with tender documents.

Drawings & Documents Required

- The Following drawings/ documents shall be submitted by Manufacturer/ Bidder.

Motor Technical Datasheet
 Motor General Arrangement & Dimension Drawing
 Terminal Box Drawing
 Performance Curves
 Quality Assurance Plan

Tests

- Motor shall be subjected to all the routine tests as per applicable standard in the presence of the PURCHASER'S representative. Copies of test certificates of type and routine tests (as per IS 12615/IEC 60034) shall be furnished for the PURCHASER'S approval. The VENDOR shall ensure to use calibrated test equipment/ instruments having valid calibration test certificates from standard laboratories traceable to national/ international standards.
- If type tests have not been carried out on similar Motors, or if the type test reports submitted are not found in order, then VENDOR shall carry out these tests without any extra cost to the Purchaser.

- All the type, routine and acceptance tests of motors shall be carried out as per applicable standard in the presence of the Purchaser/Purchaser's representative.

Routine Tests

- The following routine tests shall be carried out on 100% quantity of motors.

Insulation Resistance Test

High Voltage Test

No load running of the motor & measurement of current and voltage on all three phases

Locked rotor test at suitable voltage

Testing of accessories / auxiliaries for correct functioning

Vibration test

Noise level test

Type Tests

- The following type test shall be carried out on 1no. of each type & rating of motor

Measurement of efficiency, stator resistance and rotor resistance on slip ring motor No load running of motor and reading of voltage, current, power and speed Open circuit voltage ratio on slip ring motor

Reduced voltage running up test at no load to check the ability of motor run up to full speed on no load in each direction of rotation with $1/\sqrt{3}$ of the line voltage applied to the motor

Locked rotor reading of voltage, current, power input and torque value of the motor

Full load readings of voltage, current, power input and slip

Temperature rise test

Momentary overload test

Insulation resistance test before and after high voltage test

High voltage test

Type test reports to be submitted along-with the Bid shall not be older than five (5) years. In case type tests have not been carried out on similar Motors, or if the type test reports submitted are not found in order, then VENDOR shall carry out these tests at accredited test house like CPRI/ ERDA etc. without any extra cost to the PURCHASER.

DOCUMENTS TO BE SUBMITTED (Optional):

- ~~P & ID of the pumping system~~
- ~~Pump set Performance Curve (Flow vs Head, Flow vs Efficiency, Flow vs Power, Flow vs NPSHr, Minimum Submergence, GD² Value) along with Torque - Speed Curve of the pump set.~~
- ~~System Resistance Curve Superimposed on Solo & Parallel operation curve of Pump set.~~

- ~~General Arrangement drawing of Pump motor set with Foundation details, static & dynamic load.~~
- ~~Pump Motor Datasheet.~~
- ~~Pump House layout/sectional details indicating type of pump & motor, valves, fittings, piping arrangement, sump bed level, minimum water level, maximum water level, pump discharge floor level, starter panel, associated cabling, crane/hoisting arrangement, maintenance bay.~~

EVALUATION

- It is clarified that no commercial implications of bids based on efficiencies shall be applicable i.e. all bids below the achievable efficiencies as per HIS (without negative tolerance) or specified shall be rejected while all bids meeting or exceeding the same are to be accepted at par.

VENDOR LIST FOR EQUIPMENTS/INSTRUMENTS

The approved Vendor list for the Civil/Mechanical/Electrical/Instrumentation and other equipments is available on GWSSB's official website at <http://www.gwssb.gujarat.gov.in>. At the time of approval of QAP, the latest or amended vendor list shall be applicable & considered for executing the job.

Bidder must have to provide all electro-mechanical & instrumentation equipment including motors from approved vendor list only having "A" category as published on GWSSB website at the time of approval of QAP.

VOLUME - IIC, Technical Data-sheets & E, M & I works

PREAMBLE TO DATA SHEET

- (The Levels given in the Appendix to Bid and drawings are as per the Data available with GWIL. As the Working survey is included in scope of the work of contractor, agency shall carry out working survey along the route.
- (The Agency shall have to confirm both the levels and layout of the Head Works as per the requirement of the inter-related Structures and design accordingly. No Extra payment shall be made by the Department to the Agency for the extra excavation or for the raised structure above Ground Level.
- (The levels given in the documents are tentative as per the selected site presently surveyed. In case of shifting of the Head Works is to be necessary due to any reason, the Agency shall be bound to carry out all the works as per the new site and the design is to be carried out accordingly without any extra claims.
- (The erection & installing of Pumping Machinery includes the Piping and Cabling considering the Pump House size mentioned in the Tender. Any change in the pump house size shall not affect the Pumping Machinery Cost. No extra payment shall be made to the Agency due to increase in the Piping, Cabling or any other accessories related to the Pumping Machinery due to the increase in the size of Pump House.
- (The Pump House shall be provided with the Electric fittings with minimum required illumination with the lighting fixtures, Piping, wiring and other accessories.
- (For Construction of Civil Structures all the data are to be obtained by the agency and accordingly the structural design shall be prepared & to be got approved by GWIL

Signature of Bidder

SECTION- 1:BRIEF DESCRIPTION OF WORK

The main scope of works/ services to be done/ provided by the contractor under this bid shall be as under.

A LYING/ INSTALLATION OF MATERIAL ISSUED BY DEPARTMENT: Nil

B-1 PROCUREMENT, SUPPLY & LAYING OF PIPELINE : NIL

B-2 DESIGN AND CONTRUCTION OF CIVIL STRUCTURES: Nil

B-3 ELECTRO-MECHANICAL WORKS

Designing, procuring, erection & Commissioning of 700KW HT Electric Motor suitable for existing Wilo make Pumps detailed below.

Pump Type	Capacity	Head	KW	RPM	W + S
HSCF	3060 m ³ /Hr.	61 m.	700	989	6 W+ 2 S

B4- Operation & Maintenance : Nil

Sr No.	Particular	Months
1	Project to be covered for trial run	01
2	Operation & Maintenance after completion of the project	00
3	Defect liability period	12

SECTION- 2: MECHANICAL WORKS.

Drive Motor

Sr. No.	Parameter	Departmental Requirement	Bidder to Provide
3	DRIVE MOTOR		
3.1	General		
3.1.1	Make	As per "A" category of GWSSB/GWIL approved vendor list	
3.1.2	Frame size	Manufacturer's standard	
3.1.3	Number of units	As per Price Bid	
3.1.4	Type	Base mounted, Horizontal, TEAAC squirrel cage	
3.1.5	Mounting type	Base mounted on existing wilo make HSCF Pump frame	
3.2	Rating		
3.2.1	kW Rating	As per Price Bid	
3.2.2	Operating Voltage	3 phase, 50 Hz +/- 3%, 6.6 kV +/- 10%	
3.2.3	Speed & Direction of rotation	To suit Pump	
3.2.4	Design Ambient Temp	50 °C	
3.3	Performance		
3.3.1	Particulars at rated voltage and frequency		
	a) Starting Time		
	b) Starting current		
	c) Pull-out torque		
	d) Pull-up torque		
3.3.2	Particulars at minimum Starting voltage to accelerate pump to rated speed	Bidder to specify	
	a) Minimum required voltage		
	b) Starting time		
	c) Permissible running time at full load at minimum allowable voltage		

Sr. No.	Parameter	Departmental Requirement	Bidder to Provide
3.3.3	Locked rotor current withstand time (safe stall time) at 110% rated voltage	Bidder to specify	
	a) Cold		
	b) Hot		
3.3.4	Stator Thermal withstand time	Bidder to specify	
3.3.5	Number of Starts		
	a) Permissible no. of equally spread starts per hour under normal service conditions	Minimum 3 starts	
	b) Permissible no. of starts in quick succession with cold machine at room temperature		
	c) Permissible no. of hot restarts		
3.3.6	Efficiency		
	a) At Full Load	Minimum 96.00%	
	b) $\frac{3}{4}$ Load	Minimum 96.00%	
	c) $\frac{1}{2}$ Load	Minimum 95.30%	
3.3.7	Power Factor	Bidder to specify	
	a) At Full Load		
	b) $\frac{3}{4}$ Load		
	c) $\frac{1}{2}$ Load		
3.4	Construction Features		
3.4.1	Applicable Standards	IS 12615 / IEC 60034	
3.4.2	Operation	S1 (continuous)	
3.4.3	Enclosure	IP 54	
3.4.4	Cooling	CACA	
3.4.5	Insulation	Class F with temp rise restricted to class B	
3.4.6	Terminal Box		
	a) Phase Segregated	Bidder to specify	
	b) Fault Withstand Capacity	Bidder to specify	
3.4.7	Accessories		

Sr. No.	Parameter	Departmental Requirement	Bidder to Provide
3.4.8	Winding Temp Detectors		
	a) Type	PT 100	
	b) Numbers	Bidder to specify	
3.4.9	Bearing Temp Detectors		
	a) Type	PT 100	
	b) Numbers	Bidder to specify	
3.4.10	Space Heater		
	a) kW rating	Bidder to specify	
	b) Numbers	Minimum 1 No	
3.4.11	Coupling	Required (matched with existing WILLO make pumps)	

Signature of Contractor