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WATER RESOURCES DEPARTMENT

PRICE TENDER DOCUMENT

LUMPSUM CONTRACT

(ITEM RATE CONTRACT)

NAME OF WORK	:	**Main Work : "Construction of Tail End regulator across Bukinggam Canal at Ponnanthittu, Killai Revenue Village in Chidambaram Taluk of Cuddalore District" Sub Work: "Design Drawing, Fabrication, Supply and erection of Embedded parts Vertical Stainless Steel Shutters 10 Nos and Hoisting Arrangement in New Construction of Tail End Regulator across Bukinggam Canal along with Generator at Ponnanthittu, Killai Revenue village in Chidambaram Taluk of Cuddalore District.**

LAST DATE AND TIME FOR RECEIPT OF TENDER SCHEDULE : **UPTO 3.00 P.M. ON 20.04.2022.**

TENDER OPENING DATE AND TIME : **20.04.2022 AT 3.30 P.M.**

OFFICE OF THE
SUPERINTENDING ENGINEER, WRD.,
VELLAR BASIN CIRCLE
CUDDALORE – 1

I. INSTRUCTION TO TENDERER

1. The tender should be submitted along with a covering letter giving full details as called for in the tender notice and with particulars to the following items (i) details of Earnest Money Deposit remitted (ii) It should be stated whether they posses centering materials (steel or timber)

2. No other mode of payment other than those specified in the tender notice enclosed will be accepted as Earnest Money Deposit.

3. In the case of tenderer is eligible for furnishing Earnest Money Deposit considering concession granted to him / them and waiver of Earnest Money Deposit the reference No. and date in which the concession was granted to the tenderer to be specified. A copy of the aforesaid reference may also be enclosed for ready reference.

4. The tender must be in a sealed cover duly filled in as required and signing all the conditions, plans and schedules issued as tender documents including signing all the pages of the tender documents.

TENDERER

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddalore -1 .

ANNEXURE

(PARTICULARS TO BE FURNISHED BY TENDERER)

1.	Name of Tenderer	:
2.	Name of Work	:
3.	Date of Tender	:
4.	Total value of tender as quoted by the tenderer	:
5.	Details of EMD enclosed for the tender and its validity	:
6.	Registered class of the tenderer, with monitory limit and Dept. in which registered (Certified copy of the registration order should be attached if the registration is done in other circles)	:
7.	Recent works executed (details) about name and place of work value of work etc.. should be given)	:
8.	Work under execution (Details about name and place of work value of work etc.. should be given)	:
9.	Turnover of previous years (particulars for a period of three consecutive years to be furnished.	:
6.	Whether income tax assessment o r d e r / SARAL form is enclosed if not when it will be produced	:
11.	Whether GST clearance certificate is enclosed if not when it will be produced.	:
12.	List of machinery's available with the tenderer	:

TENDERER

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddalore -1.

APPENDIX - I

TENDER NOTICE

LUMPSUM CONTRACT

(RATE TENDER SYSTEM)

For and On behalf of the Governor of Tamil Nadu sealed Tenders will be received by the **Superintending Engineer, WRD., Vellar Basin Circle, Cuddalore - 1,** at his office **upto 3.00 Pm** on **20.04.2022** for the work of "Main Work : "Construction of Tail End regulator across Bukinggam Canal at Ponnanthittu, Killai Revenue Village in Chidambaram Taluk of Cuddalore District" Sub Work: "Design Drawing, Fabrication, Supply and erection of Embedded parts Vertical Stainless Steel Shutters 10 Nos and Hoisting Arrangement in New Construction of Tail End Regulator across Bukinggam Canal along with Generator at Ponnanthittu, Killai Revenue village in Chidambaram Taluk of Cuddalore District"

1.1 The Pre-Qualification Tender application will be opened by the Superintending Engineer, WRD., Vellar Basin Circle, Cuddalore, at **3.30 P.M.** on **20.04.2022** in the presence of the tenderers or their authorised representatives who choose to be present. The Pre- Qualification Tender received will be evaluated on a Pass or Fail basis.

The Price Tender of the qualified Tenderers alone will be opened by the Superintending Engineer, WRD., Vellar Basin Circle, Cuddalore - 1, in his chamber on intimation to the qualified Tenderers. The Price Tenders kept unopened along with the Earnest Money Deposit will be returned either by post or in person immediately on its disqualification.

1.2 The tenderers or their agents are expected to be present at the time of opening of tenders. The tender receiving officer will on opening each tender, prepare a statement of the attested and unattested corrections therein and hand it over to the tenderer concerned and initial all such corrections in the presence of the tenderer. If any of the tenderers or their agents finds it inconvenient to be present at the time, then in such a case, the tender receiving officer will on opening the tender of the absentee tenderer, make out a statement of the unattested corrections and communicate it to him. The absentee tenderer shall then accept the statement of the corrections without any question what so ever.

2. Tenders must be submitted in sealed covers, and should be addressed to the **Superintending Engineer, WRD., Vellar Basin Circle, Cuddalore -1** the name of the tenderer and name of the work being noted on the cover.

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddalore -1

TENDERER

2.1 If an individual makes the tender, he shall sign it with his full name and his address shall be given. If a firm makes it, shall be signed with the co-partnership name by a member of the firm who shall also sign his own name, and the name and address of each member of the firm shall be given. If a corporation makes the tender, a duly authorised officer who shall produce with his tender, satisfactory evidence of his authorisation shall sign it. Such tendering corporation may be required, before the contract is executed, to furnish evidence of its corporate existence.

3. Each tenderer must also send a latest copy of Income tax assessment order obtained from the appropriate income tax authority in the form prescribed there for.

3.1 In the case of proprietary or partnership firm it will be necessary to produce the certificate aforementioned for the proprietor or proprietors and for each of the partner as the case may be.

3.2 If the tenderer is a registered P.W.D contractor and if a certificate for the current year had already been produced by him during the calendar year, in which the tender is made it will be sufficient if particulars regarding the previous occasion on which the said certificate was produced are given.

3.3 All tenders received without a certificate as aforementioned will be summarily rejected.

4. Each tenderer must pay, an earnest money, a sum of Rs. **2,00,000/- (Rupees Two lakhs only)** into the branch of State Bank of India or into the Government Treasury or Sub Treasury within the jurisdiction of the Superintending Engineer concerned to the credit of Revenue deposits on behalf of the **Executive Engineer, WRD., Coleroon Basin Division, Chidambaram** and enclose with his tender the chalan endorsed accordingly.

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddalore -1

TENDERER

The contractors are also permitted to remit Earnest Money Deposit in the shape of Demand Draft or Banker's cheque obtained from Nationalised Banks / Schedule Banks duly endorsed in favour of the **Executive Engineer, WRD., Coleroon Basin Division, Chidambaram** , subject to the condition that the successful tenderer will have to convert the same in the form of small savings scripts such as NSC / KVP / Deposit accounts at the time of concluding the agreement.

The earnest money deposit can also be paid in any other form as may be approved by the State Government from time to time as per para 155 of Tamil Nadu P.W.D code. The earnest money will not be received in cash.

The EMD if produced in the shape of NSC or KVP or Deposit Account, the same should be pledged in favour of the **Executive Engineer, WRD., Coleroon Basin Division, Chidambaram** at the time of tendering for the work.

4.1 The Earnest money will be refunded to the un – successful tenderer on application, after intimation is sent of rejection of the tender or at the expiration of 3 months from the date of tender whichever is earlier. The Executive Engineer will authorize this refund by suitable endorsement on the chalan.

4.2 The earnest money will be retained in the case of successful tenderer and will not carry any interest. It will be dealt with as provided in the tender.

5. The tender will remain valid for a period of sdty days from the last date for receipt of tender. The validity period can be extended further, if the contractor gives his consent in writing, specifying the period of extension.

5.1 The tenderer whose tender is under consideration shall attend the office of the Superintending Engineer before the end of the period specified by written intimation to him. If the tenderer fails to attend the office before the end of the specified period his tender will not be considered. He shall fourth with and intimation being given to him of acceptance of his tender, by the officer duly authorised in this behalf under article 299(1) of the constitution, herein after called the " accepting authority " make security deposit of 2% of the value of contract in one of the forms prescribed in Tamil Nadu

Superintending Engineer, WRD.,
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TENDERER

P.W. (A) code (i.e) by taking into account of the amount of EMD already deposited with the tender, it would be sufficient to pay the balance amount to make up the 2% of the value of contract for the purpose of security deposit) irrevocable bank Guarantee obtained from the Nationalised Bank or Schedule Banks with a validity period of one hundred and eighty days (180 Days), in favour of the **Executive Engineer, WRD., Coleroon Basin Division, Chidambaram** after the date of completion of work will also be accepted for Security deposit.

5.1.1 On evaluation of tender, if it is found that if the tender percentage offered by the tenderer is less than 5% to 15% of the departmental value put to tender, the Contractor shall pay an additional Security at 2% of the estimated value. If the tender percentage exceeds 15% to 20% the Contractor shall pay an additional Security Deposit of 50% of the difference between the quoted amount based on percentage offered and departmental value put to tender. Failure to furnish the Additional Security Deposit within 15 days from the date of receipt of acceptance order and execute the agreement shall entail cancellation of award of contract and forfeiture of E.M.D. furnished.

5.2 The security deposit together with EMD and the amount withheld according to clause 64(1) of general conditions to the contract, shall be retained as security for due fulfillment of contract.

5.3 On receipt of written communication of acceptance of tender, if the tenderer fails to pay requisite security deposit within the period specified in the written communication or backs out from the tender or withdraw his tender the EMD shall be forfeited to the Government.

5.4 If the contractor fails to carryout the contract after paying the requisite deposits, then the contractor will be liable for the excess expenditure if any incurred to complete the work as contemplated in the General Conditions to the Contract.

5.5 It shall be expressly understood by the tenderer that on receipt of written communication of acceptance of tender from the accepting authority, there emerges a valid contract

between the Governor of Tamil Nadu and the tenderer, for execution of the work without any separate written agreement. Hence for this purpose the tender documents (i.e.) tender notice, tender offered by the contractor, General Conditions to the Contract, special conditions of the contract, negotiation correspondences, written communication of acceptance of tender etc., shall constitute a valid contract and that will be the foundation of the rights of both the parties to the contract. Provided that it shall be open to the accepting authority to insist execution of any written agreement by the tenderer, if administratively considered necessary or expedient.

6. The tenderer shall examine clearly the Tamil Nadu Building practice and also the General Conditions to the Contract contained therein, and sign the Divisional office copy of the Tamil Nadu Building Practice and its addenda volume in token of such study before submitting his tender premium, which shall be for finished the work in-situ. He shall also carefully study the drawings and additional specifications and all the documents connected with the contract. The Tamil Nadu Building Practice the other connected documents with the contract such as specifications, plans, etc. can be seen at any time during office hours in the office of the Superintending Engineer, WRD., Vellar Basin Circle, Cuddalore
7. The tenderer's attention is directed to the requirements for "Materials under the clause materials and workmanship" in the General conditions of the contract Materials conforming to the I.S.I standards shall be used on the work, and the tenderer shall quote his tender rates accordingly.
8. Every tenderer is expected, before quoting his rates, to inspect the site of the proposed work. He should also to inspect the material quarries and satisfy himself about the quality and availability of materials. The best class of materials shall be used on the work. In every case, the materials most comply with the relevant standard specifications samples of materials as called for in the standard specifications, or in this tender notice, or as required by the Executive Engineer in any case shall be submitted for the Executive Engineer's approval, before the supply to site of work is begun.

TENDERER

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Vellar Basin Circle, Cuddalore -1

8.1 The Government will not however after acceptance of contract rate, pay any extra charges for lead or for any other reason, in case the contractor is found later on to have misjudged the materials available. Attention of the contractor is directed to the " General condition to the contract regarding payment of seigniorage, tools etc.,

9. The tenderer's particular attention is drawn to the sections and clauses in the General Conditions to the Contract dealing with: -

1. Test, inspection and rejection of defective materials and work.
2. Carriage.
3. Construction plant.
4. Water and lighting.
5. Cleaning up during progress and for delivery.
6. Accidents.
7. Delays.
8. Particulars of payment.

9.1 The contractor should closely pursue all the specification clauses, which govern the contract amount payable, which he is tendering.

6. A schedule of quantities accompanies this tender notice. It shall be definitely understood that the Government does not accept any responsibility for the correctness or completeness of this schedule and that this schedule is liable to alterations by omissions, deductions, or additions at the description of the Superintending Engineer or as to set-forth in the Conditions of Contract. The tenderer will, however, base his Lump-sum tender, on this schedule of quantities. He should quote specific rates for each item in the schedule and the rates should be in rupees and paise. The rates should be written both in words and figures and the units in words. The tenderer should also show the total of each item and the grand total of the whole contract and quote in the tender a lump – sum for which he will undertake to do the whole work subject to the conditions of contract such lumpsum agreeing with the total amount of Schedule "A". This schedule accompanying the lumpsum tender shall be written legibly and free from erasures, over writings or conversions of figure, Corrections, where unavoidable should, be made by crossing out, initialing, dating and re – writing.

TENDERER

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11. Tenderers offering without tender rate on the estimate amount and those not submitted in proper form or in due time will be rejected. No alteration which is made by the tenderer, in the contract form, the conditions of contract, the drawings, specifications or quantities accompanying same will be recognised and if any such alterations are made, the tender will be void.

12. The tenderer should work out tender rate without reference being made to the Public Works Department current schedule of rates or the Public Works Department estimate.

13. Not withstanding any subsequent change in the market value for those materials, the charge to the contractor will remain as originally entered in the written contract. No centage or incidental charges will be born by Government in connection with this supply.

14. The attention of the tenderers is directed to the contract requirements as to the time of beginning works, the rates of progress and the date for the completion of the whole work and its several parts. The following rate of progress and proportionate value of work done from time to time as will be indicated by the Executive Engineer's certificate of the value of work done will be required. Date of commencement of this programme will be the date on which the site (or premises) is handed over to the contractor.

Superintending Engineer, WRD.,
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TENDERER

ANNEXURE

Period after date of commencement	**Percentage of work completed (based on contract lumpsum amount)**
1st Month to 6th Month	40% (Forty Percentage)
4th Month to 12th Month	40% (Forty Percentage)
7th Month to 18th Month	20% (Twenty Percentage)

15. No part of the contract shall be sublet without written permission of the Executive Engineer, nor shall transfer be made by power of attorney, authorising others to receive payment on the contractors behalf.

16. If further necessary information is required, the Executive Engineer of the Division will furnish such, but it must be clearly understood that the tenders must be received in order and according to instructions.

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TENDERER

17. A Tenderer submitting a quotation which the tender accepting authority considers excessive and / or indicative of the insufficient knowledge of current prices or definite attempt at profiteering will render himself liable to be debarred permanently from tendering or for such period as the tender accepting authority may decide. The tender rate should be based on the controlled price for materials if any, fixed by the Government or the reasonable price permissible for the tenderer to charge a private purchase under the provision of clause 8 of the Hoarding and Profiteering Prevention Ordinance 1943, as amended from time to time and on similar principles in regard to labour and supervision in the construction.

18. The contractor should offer employment to ex-toddy tappers as for as possible. The number of ex-today tappers to whom he can offer employment should be mentioned in the tender and he should under take in the contract to offer such employment to such number.

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19. The contractor shall comply with the provisions of the Apprentices Act 1961, and the rules and orders issued there under, from time to time. If he fails to do so, his failure will be breach of the Contract and the competent authority, may at his discretion, cancel the contract or invoke any of the penalties for the breach of contract provided in the conditions of contact. The contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provisions of the act. Contractor shall during the currency of the contract ensure engagement of the apprentices in the categories mentioned below who may be assigned to him by the director of Employment and Training / State Apprenticeship Advisor, Tamilnadu. The contractor shall train them as required under the Apprentices Act 1961, and the rules made there under and shall be responsible for all obligations of the employer under the said act including the liability to make payments to the apprentices as required under the said act.

Value of Contract	**Category**	***No. to be appointed***
Above Rs. 1.00 Crore	As per pre qualification Tender document	

Unless the contractor has been exempted from engagement of apprentices by the Director of Employment and Training / State Apprenticeship Adviser, a certificate to the effect that "The Contractor had discharged his obligation under the said Act" satisfactorily should be obtained from the Director of Employment and Training / State Apprenticeship Adviser and the same should be produced by the Contractor for final payment in the settlement of the Contractor.

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddalore -1

TENDERER

APPENDIX - II (a)

LUMPSUM CONTRACT

(Rate Tender System)

To

His Excellency the Governor of
Tamil Nadu represented by the
Superintending Engineer, WRD.,
Vellar Basin Circle,
Cuddalore

Sir,

I/We do hereby tender and if this tender be accepted undertake to execute the following works, viz., ***"Main Work : "Construction of Tail End regulator across Bukinggam Canal at Ponnanthittu, Killai Revenue Village in Chidambaram Taluk of Cuddalore District" Sub Work: "Design Drawing, Fabrication, Supply and erection of Embedded parts Vertical Stainless Steel Shutters 10 Nos and Hoisting Arrangement in New Construction of Tail End Regulator across Bukinggam Canal along with Generator at Ponnanthittu, Killai Revenue village in Chidambaram Taluk of Cuddalore District"*** as shown in drawings and describing in the specification deposited in the office of the Superintending Engineer, of WRD., Vellar Basin Circle, Cuddalore with such variations by way of alterations or additions to and omission from the said works and method of payment as are provided for in the "conditions of contract" for the sum arrived at based on tender rate offered or such other sums as may be arrived at under the clause of "General Conditions to the Contract relating to payment on lumpsum basis or by final measurement at unit price."

(1) I/We have also completed the tender price, list of items in schedule "A" annexed (in words and figures) for which I/We agree to execute the work and receive payment on measured quantities as per the general conditions to the contract.

(2) I/We do hereby distinctly and expressly declare and acknowledge that before the submission of my/our tender, I/We have carefully followed the instructions in the tender notice and have read the Tamil Nadu Building practice and the General Conditions to the Contract therein and the Tamil Nadu Buildings practice addenda volume and that I/We

TENDERER

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have made such examination of the contract documents and of the plans, specifications and quantities and of the location, where the said work is to be done and such investigation of the work required to be done and in regard to the materials required to be furnished as to enable me/ us to thoroughly understand the intention of same as to and the requirements, covenants, agreements, stipulations and restrictions, conditions contained in the contract and in the said plans and specifications and distinctly agree that I/We will not hereafter make any claim or demand upon the Government based upon or arising out of any alleged misunderstanding or misconception or mistake on my/our part of the said requirements, covenants, agreements stipulations and restrictions and conditions.

(3) I/We .... being a registered Public Works Department Contractor enclose a copy of income tax assessment order / have already produced an income tax assessment order during the current calendar year in respect of (here particulars of the previous occasions on which the certificate was produced should be given).

(4.1) My / Our legal address for service of all letters and notices will be as follows :-

5. I / We enclose the Earnest deposit of Rupees. . . . ./- (Rupees … .. . .
. . . .
. . . . in the following shape

Details of E.M.D. enclosed:

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddalore -1

TENDERER

(6) If my/our tender is not accepted this sum shall be returned to me/ us on my/our application. When intimation is sent to me/us of rejection on or at the expiration of three months from the date opening of this tender, whichever is earlier. If my/our tender is accepted, the earnest money shall be retained by the Government as security for the due fulfillment of the contract. If upon written intimation to me / us by the authority authorised by the Governor under article 299(1) of the constitution.(here in after called "the accepting authority ") I/We fail to attend the said office before the end of the period specified on such intimation, the tender will not be considered and if upon intimation being given to me / Us by the accepting authority of acceptance of my / our tender I / We fail to make the additional security deposit then, I/We agree to the forfeiture of EMD. Any notice required to be served on me/us here under shall be sufficiently served on me/us if delivered to me/us personally or forwarded to me/us by post to me / us (Registered or ordinary) or left at my/our address given herein. Such notices shall, if sent by post be deemed to have been served on me/us at the time when in due courses of post it would be delivered at the address to which it is sent.

(7) I/We fully understand that on receipt of communication of acceptance of tender from the accepting authority, there emerges a valid contract between me/us and the Governor of Tamil Nadu and the tender documents that is tender, tender notice, tender with schedule, general conditions to the contract and special conditions of the tender, negotiation letters, communication of acceptance of tenders shall constitute the contract for this purpose and be the foundation of rights of both the parties, as defined in clause 5.5 of tender notice, provided that, it shall be open to the acceptance authority to insist on execution of any written agreement by tenderer, if administratively considered necessary or expedient.

(8) I/We have also signed the copy of the TNBP and National Building Code and addenda volume thereto maintained in the . . . . . Circle / Division office, in acknowledgment of being bound by all conditions of the clauses of the General conditions to the contract and all specifications for items of work described by a specification number in schedule - A.

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddalore -1

TENDERER

(9) In consideration of the payment of contract value based on tender premium or such other sum as may be arrived at under the clause of the General conditions to the contract relating to payment on lumpsum basis or by final measurement at unit prices, I/We agree, subject to said conditions to execute and complete the works shown upon the said drawings serially numbered from Number ……. (schedule ' B ') and described in the specifications (schedule ' C ') and to the extent of the probable quantities shown in (schedule ' A ') with such variation byway of, addition to or alterations, deductions from, the said work and method of payment therefore as are provided for in the said conditions.

(10) The term "Executive Engineer" in the said conditions shall mean the P.W. officer in-charge of the divisions having jurisdiction for the time being over the work, who shall be competent to exercise all the powers and privileges reserved, herein favour of the Government with the previous sanction of or subject to ratification by the competent authorities in case where such sanction or ratification may be necessary and who has been duly authorised under article 299(1) of the constitution.

(11) I/We agree that the time shall be considered as the essence of this contract and to commence the work as soon as this contract is accepted by competent authority as defined by TNPWD code and the site (or promise) is handed over to me/us as provided for in the said conditions and agree to complete the work within (**18 months**) **Eighteen** months from the date of such handing over of site (or premises) and to show progress" as defined in tender notice subject nevertheless to the provisions for extension of time contained in clause 56 of the General conditions to the contract appended to the Tamil Nadu Building Practice.

(12) I/We agree that upon the terms and conditions of this contract being fulfilled and performed to the satisfaction of the Executive Engineer, the security deposited by me/us as herein before recited or such portion thereof as I/We may be entitled to, under the said conditions, be paid back me/us as provided in clause 64 of the general conditions of the contract.

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddalore -1

TENDERER

13(i) I am / We are professionally qualified and my/our qualifications are as follows: -

13(ii) I / We agree to employee the technical personals as furnished in the schedule "C" the name, address, qualification and experience are furnished hereunder.

TECHNICAL STAFF PROPOSED TO BE EMPLOYED			
Sl.No.	**Name and Address**	**Qualification**	**Experience**
1.	**2.**	**3.**	**4.**
1.			
2.			
3.			
4.			
5.			

(14) I/We agree that the arbitrator for fulfilling the duties set forth in the arbitration clause of the General conditions to the contract shall be as here under.

A penalty of Rs.2,000 /- per month for Diploma Holders and Rs.5,000 /- per month for Degree Holders will be levied in case of default on part of the contractors in the prescribed norms laid as per G.O. Ms. No. 181 PWD dated 16.05.2003.

Superintending Engineer, WRD.,

TENDERER Vellar Basin Circle, Cuddalore -1

Clause 69.1/ of General Conditions to be contract

In case of any disputes or difference between the parties to the contract either during the progress or after the completion of the works or after determination, abandonment or breach of the contract or as to any other matter or things arising there-under except as to matters left to the sole discretion of the Executive Engineer under clause 18,20,25-3,27-1,35,34 and 37 of General conditions to the contract or as to the with holding by the Executive Engineer of the payment of any bill to which the contractor may claim to be entitled, then either party shall forth with give to the other, notice or such dispute of difference and such dispute or difference shall be and is hereby referred to the arbitration of the Superintending Engineer, Vellar Basin Circle, Cuddalore, (herein after called the arbitrator) in cases where the value of claim is less than or upto Rs. 50,000/- (Rupees Fifty thousands only)

In case where the value of claim is more than Rs. 50,000/- the parties will seek remedy through the competent civil court.

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TENDERER

(15) On behalf of the Governor of Tamil Nadu and as duly authorised by the Governor under article 299(1) of the constitution, the above tender for a value of Rs. . . . . (Rupees. . . . .)

is accepted on this day ……..of ……..200 .

Signature of the witness in full
and address with name
in block letters.

Superintending engineer, WRD.,
Vellar Basin Circle, Cuddalore -1

SCHEDULE - " A "

NAME OF WORK: Main Work : "Construction of Tail End regulator across Bukinggam Canal at Ponnanthittu, Killai Revenue Village in Chidambaram Taluk of Cuddalore District" Sub Work: "Design Drawing, Fabrication, Supply and erection of Embedded parts Vertical Stainless Steel Shutters 10 Nos and Hoisting Arrangement in New Construction of Tail End Regulator across Bukinggam Canal along with Generator at Ponnanthittu, Killai Revenue village in Chidambaram Taluk of Cuddalore District.

(a) The quantities given here are those upon which the lumpsum tender cost of the work is based but they are subject to alterations, omissions, deductions or additions as provided for in the conditions of this contract and do not necessarily show the actual quantities of work to be done. The unit rates noted below are those governing payment for extras or deductions or omissions according to the conditions of the contract, as set forth in the General Conditions of the Contract of the Tamil Nadu Building Practice and other conditions or specifications of this contract.

(b) It is to be expressly understood that the measured work is to be taken net (not withstanding any custom or practice to the contrary) according to the actual quantities when in place and finished according to the drawings or as may be ordered from time to time by the Executive Engineer and the cost calculated by the measurement or weight at the respective prices, without any additional charge for any necessary or contingent works connected there with. The rates quoted are for works in - situ and completed in every respect.

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TENDERER

Name of Work: Main Work : "Construction of Tail End regulator across Bukinggam Canal at Ponnanthittu, Killai Revenue Village in Chidambaram Taluk of Cuddalore District" Sub Work: "Design Drawing, Fabrication, Supply and erection of Embedded parts Vertical Stainless Steel Shutters 10 Nos and Hoisting Arrangement in New Construction of Tail End Regulator across Bukinggam Canal along with Generator at Ponnanthittu, Killai Revenue village in Chidambaram Taluk of Cuddalore District.

Sl. No.	Probable Quantity	Description of work to be executed	T.N.B.P. No. (or) T.N.D.S. No.	Unit of calculation both in figures and in words	Rate in Figures and in words (in Rupees)	Amount (in Rupees)
1	10.00Nos (Ten Numbers)	Fabricating, Supplying and Erection of screw Gearing stainless steel shutters , each shutter having a size 2.30 x 1.44m consists of skin plate made out of 10mm thick stainless steel plate (316LGR) and horizontally siffened with four rows of 150 x 75 mm stainless steel joist (316LGR) and vertical stiffeners made out of 150 x 10 mm (316LGR) SS Flat at an interval not more than 0.60m and end verticals made up of 150 x 12 mm (316LGR) SS plates 2NOS on both side provided with 150mm dia (316LGR) rollers 2Nos on both side with 2 2 dia gun metal bushes and 2" dia roller pin for smooth operation. The Shutter lifted with 12mm thick (316LGR) gusset plate required size on both sides fastened with SS bolts and nuts etc. Providing leakage arrest by using 75 x40mm(316LGR) channel sandwiched with "Z" type rubber seal covered 65x8 flat holded with bolt and nut arrangements made stainless steel pipe at both ends for required height welded with top of the shutter, the bottom seal made up of 75x10mm flat rubber seal covered with 65x8mm (316LGR) Flats fastened with required SS bolts and nuts. The shutter Groove angle made up of 200x200x8mm stainless steel angle for required height of two numbers on both sides including welding hold fast of size 50x50x6mm angle 3Nos on both sides. The groove angle weld with sill beam made out of MS beam 150x75mm RSI of length of required and the SS plate of size 75x6mm welded in the top of the sill beam. Fixing the angle to the grooves in proper alignment and Position. The of screw rod made up of 80mm dia stainless steel (316LGR) duly machined and fully threaded to suit the worm gear box and provided with required holes. Fixing the screw rod to the shutters gusset plate with required bolt and nut in proper alignment to the gear box.. The cost includes cost of all materials, cost of consumables like welding, rods, grinding wheel, oxygen & acetylene gas, diesel & oil for generator, process charges like gas cutting, welding, labour charges for dismantling, loading, lifting, unloading, transport, erection, hire charges for equipments like chain pulley block, welding machine, cutting set, grinding machine, power charges for generator, INCLUDING ALL TRANSPORTATION and conveyance to site and clearing them after completion of work, including cost of trial operation. Design, fabrication, supply & erection of MS deck bridge suitable for vertical gate arrangements of size 3000 x 2400mm,. The deck bridge shall be made with main girder in ISMB 200, base plate & bearings plate of 12mm thick. The anchor rods shall be made with 20mm dia ms rod and cross girders with ISMC 50. The handrail and connecting angles shall be done with ISA 65 x 65 x8mm. The handrail pipes shall be made with 25mm dia ms pipe and chequred plate shall be 6mm thick. The cost includes cost of all materials, cost of consumables like welding rods, grinding wheels, oxygen & acetylene gas, diesel &	Special	1 No. (One Number)		

		oil for generator, process charges like gas cutting, welding, labour charges for dismantling, loading, lifting, unloading, transport, erection, hire charges for equipments like derrick, chain pulley block, power charges for generator, conveyance to site and clearing them .after completion of work, complete as directed by the departmental officers. Design, fabrication, and installation of electrical hoisting arrangement for operate the shutter. The hoisting arrangement consist of 3HP reversible induction motor of 1440 RPM, reduction gear box for to reduce to required speed and torque, Starter box, sub panel board, main changeover panel ,etc,. the electrical actuator were connected with required proper wiring and proving change over for external EB line The cost includes cost of all materials, cost of consumables like welding rods, grinding wheels, oxygen & acetylene gas, diesel & oil for generator, process charges like gas cutting, welding, labour charges for dismantling, loading, lifting, unloading, transport, erection, hire charges for equipments like derrick, chain pulley block, power charges for generator, conveyance to site and clearing them after completion of work etc., complete as directed by the departmental officers. including cost of trial operation. with the warranty period for 5years. The Rate Excluding CGST and SGST.				

Sl. No.	Probable Quantity	Description of work to be executed	T.N.B.P. No. (or) T.N.D.S.	Unit of calculation both in figures and in words	Rate in Figures and in words (in Rupees)	Amount (in Rupees)
12	1.00 no (One number)	Supply of 1 No. 40 KVA diesel generator set Engine is water cooled diesel engine suitable for generator application with a shaft output of BHP - 156 at 1500 rpm. The engine Shall comprise the following standed scope of supply: (Kirloskar/Cummins/ Ashok leyland/equivalent) The generator engine should contain Dry type air cleaner, Expansion bllow, Radiator with fan mounting, Air to air charge cooler, Exhast gas turbo charger Lube oil Cooler, Lube oil filter, Fuel filter (pre and Micro) In-line mono-block fuel injection pump with Electronic Governor, 2Nos of 12V Battery charging alternator 12 Volt electric starter motor, Residential Mufler, Fly wheel with starter ring, Engine control panel consisting of ON/OFF/START key, Lube oil pressure gauge, gague and electronic hour meter and RPM indicator and safety system of engine, AMF control panel, Acoustic Enclosure, Acoustic enclosure shall be powder coated and fabricated out of 16 SWG CRCA MS sheet. The silent canopy shall be of nut bolt type construction it should be painted with Surface treatment painting. The Base frame is fabricated in sheet metal, The base frame is rugged in construction and designed for mounting engine and brush less alternator close coupled, with crossmebers mounted on AVM. The base frame shall have provision for mounting of acoustic enclosure on it. The supply of gen set includes loading unloding and transportation charges The Fuel Tank 60 Ltrs. Removable Fuel tank shall be fabricated out of 1.6mm CRCA MS sheet and is part of base frame. It is duly painted and fitted with inlet and outlet connections and mechnical fuel gauge. Fuel tank can be easily removed for cleaning or any maintenance. vent breather and gauge etc., and as directed by the departmental officer, with the warranty period for 5years. Excluding of GST (Rate as per SOR 2021-22, Annexure-VII, Electrocal Items, Item No.9 h Page No.146.)	Special	1 no (One number)		
					Total Basic Value	
					Add G.S.T at 12%	
					Grand Total Value of Tender	

The Item Contains 2 (Two) Items Only.

The Item value Rs._____/- (Rupees _____ only)

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddalore -1.

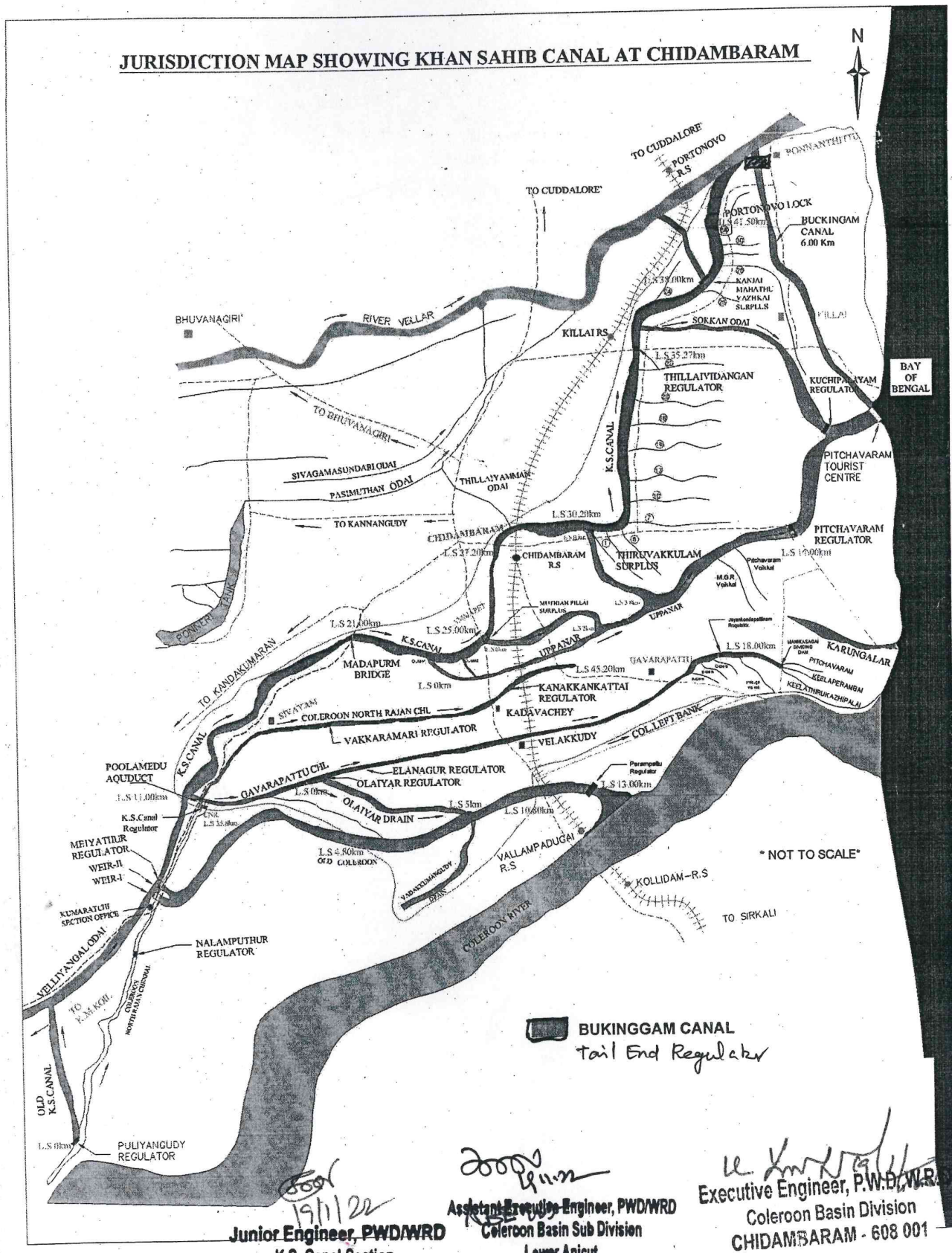
SCHEDULE – ` B ’

LIST OF DRAWINGS	*SUPPLEMENTAL LISTS*
Note : All drawings to be signed by the contractor as well as the officer entering in to the contract	As referred to in the specifications including the General Condition to the Contract of Tamil Nadu Buildings Practice

Sl. No.	Drawing No.	Description	S.No	Drawing No.	Description	Date on which the drawing was supplied.
1.	2.	3	4.	5.	6.	7.
1.	1	Location Map				
2.	1	Shutter Drawing				

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddalore -1.

TENDERER

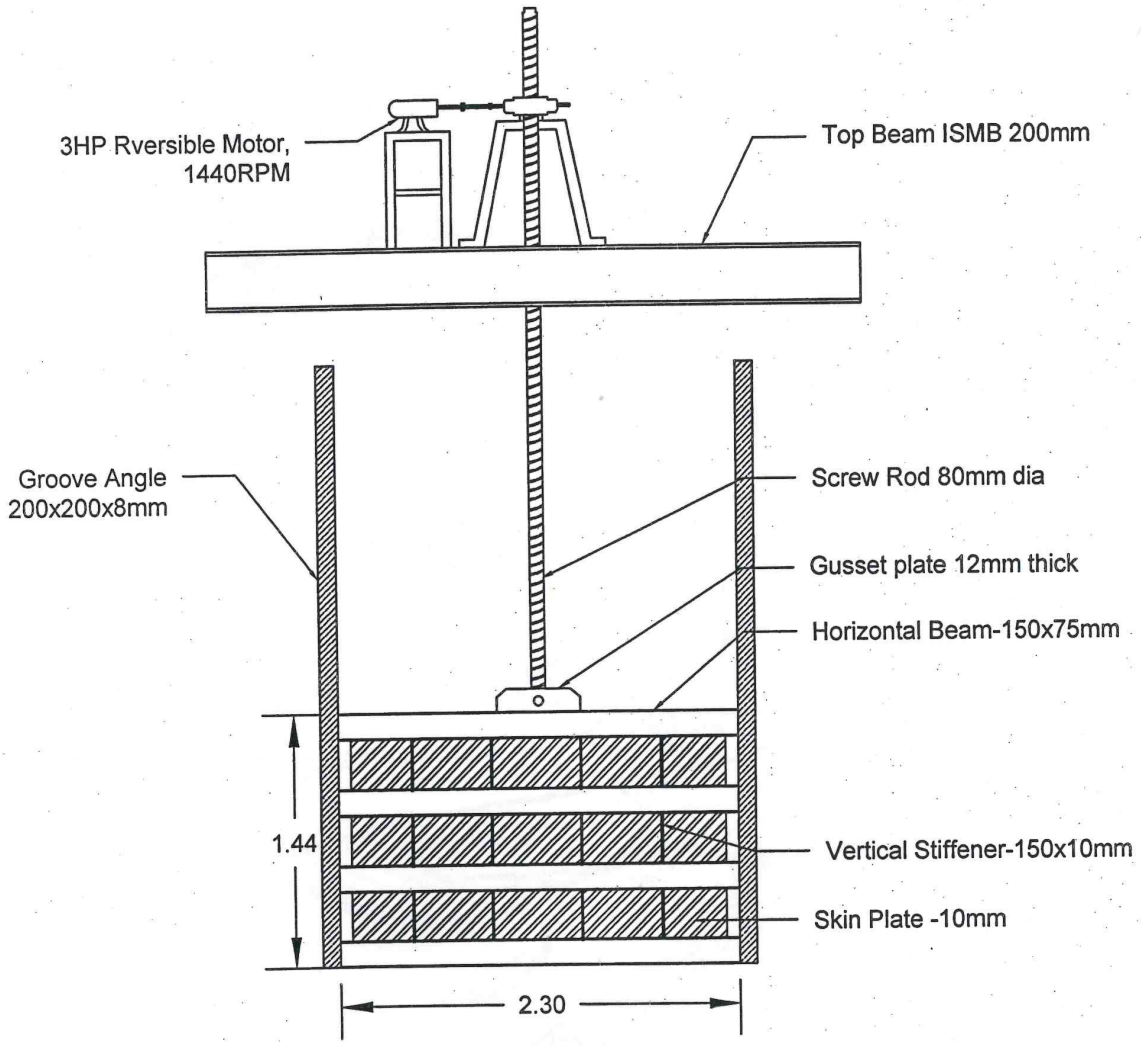


19/1/22
Junior Engineer, PWD/WRD
K.S. Canel Section,
Chidambaram - 608 001.

Assistant Executive Engineer, PWD/WRD
Coleroon Basin Sub Division
Lower Anicut.

Executive Engineer, P.W.D./W.R.O.
Coleroon Basin Division
CHIDAMBARAM - 608 001

BUKINGGAM CANAL TAIL END REGULATOR
STAINLESS STEEL SHUTTER



SECTION

19/1/22
Junior Engineer, PWD/WRD
K.S. Canel Section,
Chidambaram - 608 001.

Assistant Executive Engineer, PWD/WRD
Colercon Basin Sub Division
Lower Anicut.

19/1/22
Executive Engineer, P.W.D.,W.R.D.
Colercon Basin Division
CHIDAMBARAM - 608 001

CHAPTER - I

SCHEDULE . C.

List of specifications for the various items of works supplementing those described in schedule A by standard specification numbers – Nil.

(1) The contractor shall employ the following technical staff for supervising the work and shall see that one of them is always at site, during working hours, personally checking all items of work and paying extra attention to such works as may demand special attention (e.g) Reinforced cement concrete work etc...

Technical staff proposed to be employed for this work	
I. value of Contract from above Rs.1.00 Crore	As per pre qualification Tender document

Note :- In case the contractor is him-self professionally qualified the above specification should be suitably altered and in case in which the contractor elected has not given an undertaking to employ qualified men it should be scored out.

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddalore -1

TENDERER

AMENDMENT TO GENERAL SPECIAL CONDITIONS – GST

In the said condition No. 9, in Chapter – General Special Conditions

(i) For the expression of sales tax the expression Goods and Services Tax shall be substituted and the expression of Madras General Sales Tax Act 1939 the expression Goods and Services Tax 2017 shall be substituted.

(ii) For the expression

1. The entire work should be carried out as per specifications of the Tamilnadu Building Practice and the additional specifications enumerated, as from time to time.
2. The rates specified in the schedule for the different items of work are for the finished work.
3. The shed for storing materials should be put up by the contractor at his, own cost.
4. The contractor should satisfy himself about the availability of the various materials at the quarries before tendering for the work.
5. The contractor will be held responsible for the proper and safe custody of all the departmental materials, which are handed over to the contractor until they are used on the work or taken over by the department.
6. The Executive Engineer will be at liberty to carry out any portion of the work at any time either departmentally or through other agency in the interest of Government work without assigning any reason to the contractor who is actually doing the work. The contractor is not entitled for any compensation on account of the same. The contract will be only subject to this condition.
7. The contractor has to make his own arrangements for procuring water for construction purpose. Construction and curing should be done with water free from injurious amounts of deleterious materials, potable water are generally considered, satisfactory for curing and fixing concrete and masonry. However the water tube used should be periodically tested at contractors cost for its suitability for using in the construction work and got approved from Department Engineers.
8. The contractor shall offer employment to ex today tappers and refuges from Burma and Malaya.
9. The Contractor rates are inclusive of sales tax payable by the contractor to the Government as per Madras General Sales Tax Act 1939 as amended from time to time. No extra rates will be payable to the Contractor for any upward revision of sales Tax during the currency of contract.
10. The contractor shall be responsible for the payment of seigniorage charges to the forest Department and Revenue Department if the contractor quarries the materials from the above departmental lands.
11. The contractor shall be responsible for the payment of seigniorage charges to the concerned department of the Government if any demands received from other departments in this respect it will be recovered from the contractor's bills and remitted to the department concerned.

CONTRACTOR

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddaore - 1.

CHAPTER - II

S C H E D U L E – " D "

Rules for the provision of Health and Sanitary Arrangements for workers employed by Contractors

Applicable to all cases of work other than those relating to roads, channels and canals where a minimum of 50 workers are employed.

The Contractor's special attention is invited to clause 37,38,39 and 51 of General Conditions of Contract of the Tamil Nadu Building Practice and he is requested to provide at his own expense, the following amenities to the satisfaction of the Executive Engineer.

1. ***FIRST AID AT THE WORK SITE :-*** *There shall be maintained in a readily accessible place first aid appliances and medicines including adequate supply of sterilised dressings and cotton wool. The appliances shall be kept in good order. They shall be placed under the charge of responsible person who shall be readily available during working hours.*

2. DRINKING WATER : -

a. *Water of good quality fit for drinking purpose shall be provided for the workers on a scale of not less than 3 gallons per head per day.*

b. *Where drinking water is obtained from an intermittent Public water supply system for each work place, it shall be provided with storage tanks where such drinking water shall be stored.*

c. Every water supply and storage shall be at a distance of not less than 50 M from any latrine, drain or other sources of pollution. Where water has to be drawn from the existing well which is drawn from it for drinking, all such well shall be entirely closed in and be provided with a trap door which shall be dust and water proof.

d. A reliable pump shall be fitted to each well the trap cover shall be kept locked and opened only for inspection or cleaning which shall be done at least once in a month.

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddalore-1

TENDERER

3. **WASHING AND BATHING PLACES :-** Adequate washing and bathing places shall be provided separately for men and women, such places shall be kept in clean and well drained condition. Bathing or washing should not be allowed in or near any drinking well.

4. LATRINE AND URINALS :-

These shall be provided within the premises of every worker's hut. The Executive Engineer in any particular case or on the scales shall on the following scale or so direct latrine and Urinals in an accessible place and the accommodations separately for each of them.

1. Where the No. of persons employed does not excess 50 2seats

2. Where the No. of persons employed exceed 50 and but does not exceed 100 3seats

3. For every additional 100 persons. 3seats

If women are employed separate latrines and urinals separated from those for men shall be provided in the same scale. Except in work site provided with water flush latrines connected with water borne sewage systems. All latrines shall be provided with receptacles on dry earth system, which shall be cleaned at least 2 times daily, and at least twice during working, kept in strictly sanitary condition. The receptacles shall be tarred inside and outside at least once a year. The excreta from the latrines shall be disposed off at the contractor's expenses, in out way pits approved by the local public health authority. The contractor shall also employ adequate No. of scavenger and conservancy staff to keep the latrines and urinals in clean conditions.

5. **SHELTERS DURING RESTS:-** At the work site, there shall be provided free of cost two suitable sheds one for meals and the other for rest for the use of workers.

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddalore -1

TENDERER

6. **CRECHES:-** At every work site at which 50 or more women workers are ordinarily employed, there shall be provided two huts of suitable size for the use of children under the age of 6 years, belonging to such women. One hut shall be used for infant's games and play and the other as their bedroom. The huts shall not be constructed on a standard lower than the following:-

   1) a)Thatched roofs. (b) Mud floor and walls.

   2) Planks spread over the Mud floor and covered with matting.

   The use of the huts shall be restricted to children, their attendants and mother of the children.

7. **CANTEEN:-** A cooked food canteen at a moderate scale be provided for the benefits of the workers as it is considered, out of specific approval of the Executive Engineer.

8. ***SHEDS FOR WORKSMEN:-*** *The Contractor should provide at his own expenses sheds for housing the workers. The shed floor area of about 6′ x 5′ for each person shall be provided. The sheds are to be provided with rear width of 5′ clear space between sheds and 28′ clear space between roofs if conditions permit. The workers camp shall be laid out in unit for 400 persons and each units to have clear space of 400 feet on each side.*

9. The contractor should dismantle the temporary hutments, tents and remove the labourers engaged at the work as soon as the work is completed at his cost. If this is not done by him within three months from the date of completion of the work, the department will arrange for dismantlement of the hutments and remove the labourers and recover the proportionate cost from his final bill and other amount due to him.

Superintending Engineer, WRD.,
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TENDERER

CONDITION FOR EMPLOYMENT OF TECHNICAL ASSISTANT

1. *The tenderers who are themselves, not professionally qualified shall undertake to employ qualified technical man/men at their cost to look after the work. The tenderer shall state in clear terms whether they are professionally qualified or whether they agree to employ technical man/men required by the department specified in the schedule below for the work, in case the selected tenderer is professionally qualified or has undertaken to employ technical man/men under him. He should see that one of the technically qualified men as the case may be always at the site of work during working hours personally checking all items of work paying extra attention to such works as may demand special attention (i.e.) reinforced concrete works.*

2. If the tenderer is professionally qualified fails to present and personally checking the item of works as enumerated above and if not professionally qualified fails to employ the Technical man as indicated above for the work, Penalty shall be levied as detailed for such non – presence or non – employment of technical man/men.

Note :- In case of contractor who is professionally qualified is not in a position to remain always at the site of work during working hours personally checking all items of works and pay extra attention to such works as may demand special attention. e.g. R. C. works etc., he should employ technically qualified man/men as prescribed for the work.

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddalore -1

TENDERER

3. If the tenderer is professionally qualified fails to present and personally checking the item of works as enumerated above and if not professionally qualified fails to employ the Technical man as indicated above for the work, Penalty shall be laid as detailed for such non – presence or non – employment of technical man.

Note :- In case of contractor who is professionally qualified is not in a position to remain always at the site of work during working hours personally checking all items of works and per extra attention to such works as may demand special attention. E.G. / R.G. works etc., he should employ technically qualified man as prescribed for the work.

4. However, it would not be incumbent on the part of contractor to employ technical Assistant / Assistants when the work is kept in abeyance due to valid reasons and if during such period in the opinion of Executive Engineer the employment of Technical Assistant is not required for the due fulfillment of the contract.

5. The employment of Technical Assistant/s could be based only in the value of contract. Engineers with Mechanical Engineering Qualification and retired from Civil Engineering Departments of Government alone considered as equal to Civil Engineer for employment as Technical Assistant and hence no private mechanical Engineers will be entertained for this purpose.

6. The entire clause relating to employment of Technical Assistant will be applicable for works given on tender under piecework contract and not for the works given on nomination under piecework system.

7. A penalty of Rs. 2000/- per month for Diploma holder and Rupees 5000/- Per month for degree holder be levied in case of default on the part of tenderer in the following norms laid down above.

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddalore -1

TENDERER

GENERAL SPECIAL CONDITIONS.

1. The entire work should be carried out as per specifications of the Tamilnadu Building Practice and the additional specifications enumerated, as from time to time.
2. The rates specified in the schedule for the different items of work are for the finished work.
3. The shed for storing materials should be put up by the contractor at his, own cost.
4. The contractor should satisfy himself about the availability of the various materials at the quarries before tendering for the work.
5. The contractor will be held responsible for the proper and safe custody of all the departmental materials, which are handed over to the contractor until they are used on the work or taken over by the department.
6. The Executive Engineer will be at liberty to carry out any portion of the work at any time either departmentally or through other agency in the interest of Government work without assigning any reason to the contractor who is actually doing the work. The contractor is not entitled for any compensation on account of the same. The contract will be only subject to this condition.
7. The contractor has to make his own arrangements for procuring water for construction purpose. Construction and curing should be done with water free from injurious amounts of deleterious materials, potable water are generally considered, satisfactory for curing and fixing concrete and masonry. However the water tube used should be periodically tested at contractors cost for its suitability for using in the construction work and got approved from Department Engineers.
8. The contractor shall offer employment to ex today tappers and refuges from Burma and Malaya.
9. The Contractor rates are exclusive of GST payable by the contractor to the Government as per Goods and Service Tax Act as amended from time to time. No extra rates will be payable to the Contractor for any upward revision of GST during the currency of contract.
10. The contractor shall be responsible for the payment of seignior age charges to the forest Department and Revenue Department if the contractor quarries the materials from the above departmental lands.
11. The contractor shall be responsible for the payment of seignior age charges to the concerned department of the Government if any demands received from other departments in this respect it will be recovered from the contractor's bills and remitted to the department concerned.

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TENDERER

12. No royalty shall be charged due for materials quarried from the public works Department or other Government quarries. Assistance as necessary will be given to the contractor by the PWD to obtain access to the quarries approved by the Executive Engineer.

13. Royalty charges due for use of private quarries, and private lands shall be, paid by the contractor.

14. No plot rent shall be charged for materials stacked on the Govt. Land during the course of construction provided such materials are removed within a month after the work is completed.

15. The contractor shall keep up the programme of execution as per the time schedule enclosed with the schedule failing which the penal clauses will apply.

16. Tenders should be obtain from the authorities concerned, an Income Tax Verification certificate and sales Tax Clearance certificate for the current year and submit them along with the tender. The tenderers who are engaged in works contract as well as business of selling materials should produce the Goods and Service Tax (GST) clearance certificate and others should produce Nil Certificate.

17. Before the payment of final bill the contractor shall also Produce a certificate from the Income Tax authorities that all Income Tax payable by him up to date has been paid.

18.a. Deductions in Income tax at the rate of 2% will be deducted at the time of Payments on the total value of work done including cost of materials supplied departmentally if the cumulative value of work done exceeds Rs.5000/-

18.b. As per the new provision under GST Act , GST @ 12% will be made at the time of payment on the total value of work done.

19. Tenders with tempered seals will not be considered generally.

20. Tenders in which the rates are not written in words will summarily the rejected. In cases of any discrepancy while expressing rates in words, the rate whichever is advantageous to Government will only be taken into account.

21. Tenders addressed by name to the Superintending Engineer will be summarily rejected.

22. Tenders containing over writing of correction, which are not attested by the tenderers, will be liable for rejection.

23. The work will be executed as per Tamilnadu Buildings Practice in CGS units and payments will be made on measurement recorded in CGS units (F.P. units where indicated are for guidance only)

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddalore-1

TENDERER

24. In the event of the work being transferred to any other Circle / Division / Sub Division the Superintending Engineer / Executive Engineer / Assistant Executive Engineer have jurisdiction over the work shall be competent to exercise all the powers and privileges reserved in favour of the Government.
25. If night work is required to fulfill the agreed rate of progress the contractor including lighting without any claim for extra rate shall make all arrangements.
26. The contractor shall not employ the labour below the age of 12 years.
27. Payment will be made on detailed measurements. If any of the item in the schedules be omitted or quantity radically altered, no variations in the rate shall become payable to the contractor on account of such omission or variations in quantities.
28. The contractor shall take all precautionary arrangements to avert any Accidents, the Contractor will be fully responsible for any accident occurred during execution of work for labour, materials and machinery etc..,
29. The contractor shall execute the various items of works as per approximate quantities of work given in the schedule – A and as per the General Conditions to the Contract of TNBP clause, regarding "Alterations and additions" The contractor shall have no claim if any part of work is deviated. The contractor shall execute additional quantity of work of 25% of each item at the agreement rates. For additional quantities above 25% the contractor should take specific written orders of the Executive Engineer before executing additional quantities beyond 25%.
30. It should be the responsibility of the contractor to ensure carrying out the works uninterrupted as programmed, Necessary river diversion / baling etc.. found necessary during execution so as to carryout works uninterrupted the same should be done by the contractor at his own cost.
31. Periodic random core samples from the finished works during execution will be taken at the direction of the Executive Engineer and sent for test. If samples do not satisfy the specification such work will have to be rectified in case where the rectification is possible or reconstructed. Where rectification is no possible as decided by the Executive Engineer, the extra cost involved will have to be borne by the contractor for such rectification or reconstruction.

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Vellar Basin Circle,Cuddalore-1

TENDERER

32. The work executed by the contractor under this contract shall be maintained at the contractor risk until the work is taken over by the Executive Engineer. The contractor shall accordingly arrange his own insurance, against fire and other usual risk during such period unless otherwise specified. Provided however, that the contractor, shall not be liable for all or any loss or damages, occasioned by or arising out of acts of God, and in particulars unprecedented flood, volcanic eruption, earth quake or other convulsion of nature, invasion, the act of foreign enemies, hostilities or warlike operations (before or after declaration of war) rebellion, military or usurped power.

33. If at any time subsequent to the execution of this agreement the Government materials other than those specified in the agreement are supplied to the contractor for use of works, the same will be charged at the marked value prevailing, at the time of supply by department plus 10% charges or departmental issue rates whichever is higher. The contractor will be informed in writing the rate which he demands for finishing the work in view of the fact that he is to use, Government materials, No cartage or incidental charges will be borne by the Government, in connection with the supply of the materials referred to in this paragraph.

34. Any materials proposed to be used on the work of which the detailed specification and quality are not given in the Tamilnadu Building Practice should have been certified by the ISI. All materials inferior in quality and also not certified by the ISI if used on the work shall have moved and replaced with ISI certified materials at the cost of the contractor. The Executive Engineer's approval should be obtained before use on work for all the materials.

35. The contractor shall form his own approach track to the work site for which no extra rate will be paid to him. On completion of the work, the contractor shall not be permitted to remove the materials laid for formation of road. If the contractor is allowed to use the existing roads he shall maintain them in good condition at his own cost throughout the period of contract.

36. The contractor shall Tender by the contractor labourer regulation of the PWD framed by the Tamilnadu Government in respect of payment of wages Act, Workmen compensation Act, Industrial dispute Act, Shops and Establishment Act and Factories Act wherever applicable.

Superintending Engineer, WRD.,
Vellar Basin Circle,Cuddalore-1

TENDERER

37. Sufficient labourers as may be required by the Executive Engineer shall be employed at the work so as to achieve progress of work as will be determined by the Executive Engineer.

38. Additional items of work not contemplated in the tender schedule shall not be executed without the written orders of the Executive Engineer, Payment for such items of works will be made only after the rates are settled in advance and accepted by the competent authority.

39. Any amount fallen as due from the contractor an account of this contract or even after effecting recoveries from the bills for this work and other works entrusted to the contractor will be arranged to be recovered from the contractor under the provision of the Revenue Recovery Act.

40. If the contractor fails to start the work within a fortnight from the date of work order and from date of acceptance of the agreement the penal action will be taken as per the terms and conditions of the contract.

41. The work shall be carried out with the least hindrance to the adjoining buildings and the contractor will be responsible for any damages causes to the existing structures, fixtures, fittings etc., in the course of execution and the contractor shall make good any such damages without any claims for extra.

42. The contractor should use steel centering as per specification and the required finish to the exposed surface of R.C.C. works is to be obtained.

43. Centering and forms shall be provided to the extent and area ordered by the Executive Engineer during execution.

44. In the case of any breach of the terms of the contract, the contract will be closed at the risk and costs of the contractor in addition to the forfeiture of the EMD and Security Deposit.

45. Unless otherwise specified all the rates quoted by the contractor shall be for works at all levels of construction.

46. Rates for every item of works to be done under this contract shall be for lifts and leads, heights, depths, length and widths except when specifically mentioned in the item, otherwise nothing extra will be paid on this account.

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddalore-1

TENDERER

47. The work shall be carried out as per drawings and designs supplied by the Department and as directed by Executive Engineer.

48. The rate for all item in which use of cement is involved is inclusive of charges for curing.

49. **Electricity:** The contractor should make his own arrangements for obtaining electricity for all types of his use like lighting, welding and pumping.

50. Any damage to work resulting from rains or from any other cause until these work is taken over by the Department after completion will be made good by the contractor at his own cost.

51. The contractor should follow the General rules as to scaffolds appended in the Tamil Nadu Public Works Department Safety Code (Appendix No. I of T.N.B.P.)

52. Recovery under Revenue Recovery Act:- Wherever any amount has to be paid by the contractor, in view of determination of the contract by virtue of clauses 57 4 or any amount that may be due or may become due from the contractor under these provisions and the contractor is not responding to the demands for the payments of the said amount, then the Government shall be entitled to recovery the said amount under the provisions of the Tamil Nadu Revenue Recovery Act. 1864. (Tamil Nadu Act. V of 1864).

53. CERTIFICATE TO BE ISSUED BY THE EXECUTIVE ENGINEER OR SUB DIVISIONAL OFFICER ON THE COMPLETION OF THE ENTIRE WORK:-

1) The Security deposit shall be released only after 1 (One) year from the date of completion of work, while no defects are found during the above shrinkage period.

2) Under the certificate to be issued by the Executive Engineer or Sub Divisional Officer on the completion of the entire works, the contractor will receive the final payment of all the moneys due or payable to him under or by virtue of the contract except security deposit and the withheld amount equal to 2 ½ percent of the total value of the work done provided there is no recovery from or forfeiture by the contractor to be made under clause 57. The amount withheld from the final bill will be retained under ' DEPOSITS ' and paid to the contractor after one years reckoned from the date of completion of work or as soon after the expiration of such period of one years as all defects shall have been made good according to the true intent and meaning hereof whichever shall last. In the event the final bill remains unpaid even after the period of 5 (Five) years aforesaid the Executive Engineer

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shall refund the security deposit which, includes the E.M.D. on a separate bill if requested for by the contractor In writing. No certificate of Executive Engineer or Sub-Divisional Officer shall be considered conclusive evidence as to the sufficiency of any work or materials or correctness of measurements to which it relates, nor shall it relieve the contractor from his liability to make good defects as provided by the contract. The contractor when applying for a certificate, shall prepare a sufficiently detailed bill based on the original figures of quantities and rates in the contract schedule – ' A ' to the satisfaction of the Executive Engineer to enable the Executive Engineer or the Sub Divisional Officer to check the claims and issue the certificate. The certificate as to such of the claims mentioned in the application the Executive Engineer allows as or the Sub Divisional Officer shall be issued within fourteen days of the application. No application for a certificate shall be made within fourteen days of a previous application.

3) The accounting for each slice of work shall be dealt with by the appropriate Executive Engineers individually. The final bill for each sluice shall be made separately as & when the work gets completed. The retention money of $2\ ^{1/2}$ % may be withheld in the final bill of the subject work and released by the Executive engineer concerned after completion of one year for each work individually. Alternatively, a BG may be obtained for a value equivalent to that of the retention money for one year and the retention money released with the final bill. However the security deposit remitted by the contractor for all the slices together shall be refunded only after one year of the completion of all slices. Alternatively, a BG may be obtained equivalent to the security deposit and the SD released with final bill of the last slice of work by the executive Engineer/WRD., Coleroon Basin Division, Chidambaram .

MILE STONE

Period after date of commencement	**Physical Progress (Percentage of work completed (based on contract lumpsum amount))**
At the end of 6th Month	40% (Forty percentage)
At the end of 12th Month	40% (Forty percentage)
At the end of 18th Month	20% (Twenty percentage)

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PLASTERING AND POINTING

Preparation of Mortar for Plastering Work

Unless otherwise specified the cement mortar used in plastering work shall be in cement mortar 1:3; 20mm thick over R.R. masonry works as specified in bill of quantities. The other specifications and conditions enunciated in paragraph 5.2.1 shall apply for this mortar for plastering work also.

Preparation of Mortar for Pointing

The cement mortar used in pointing work shall be cement mortar mix 1:4 (one cement four sand by volume). For masonry on the upstream side raised pointing and for the masonry on the downstream side simultaneous flush pointing as specified in the bill of quantities.

The other specifications and conditions enunciated in paragraph 5.2.1 shall apply for this mortar for pointing work also.

Plastering with Cement Mortar 1:3 (by volume) – 20mm thick

Preparation of surface

The roughening of the background improved the bond of plaster. All joints shall be thoroughly raked. After roughening the surface, care shall be taken to moisten the surface sufficiently before plastering as otherwise freshly exposed surface may tend to absorb considerable amount of water from the plaster. The surfaces shall be wetted evenly before applying the plaster. Care shall be taken to see that the surface is not too dry as this may caused lack of adhesion or excessive suction of water from the plaster. A fog spray may be used for this work. As far as possible, the plaster work shall not be down under hot sun.

Laying of Plastering with cement mortar 1:3 20mm thick.

The mortar used for plastering shall be stiff enough to cling and hold when laid. To ensure even thickness and true surface, plaster shall be applied in patches of 150mm x 150mm of the required 12mm/20mm thickness at not more than 2 Metre s intervals horizontally and vertically over the entire surface to serve as guides. The surface of these guides shall be truly in the plane of the to be finish plaster surface and truly plump. The mortar shall then be applied to the surface to be plastered between the guides with a trowel. Each trowel full of mortar shall overlap and sufficient pressure shall be used to force it into thorough contact with the surface. On relatively smooth surfaces, the mortar shall be dashed on with the trowel to ensure adequate bond. The mortar shall be applied to a thickness slightly more than that specified, using a string, stretched out between the guides. This shall then be brought to a true surface by working with a long wooden float small-motion. The surface shall be periodically checked with a string stretched across it. Finally the surface shall be rendered smooth with a small wooden float, over working shall be avoided. All corners arise, and junctions shall be brought truly to a line with the necessary rounding or chamfering. If it is necessary to suspend the work at the end of the day it shall be left in a clean horizontal or vertical line not nearer than 150mm from any corner or arises or on parapet ops or on copings etc. When recommencing the work, the edges of the old work shall be scraped clean and treated with cement slurry before the new plaster is laid adjacent to it. After the first coat is done it shall be kept undisturbed for the next 24 hours and thereafter kept moist and not to be permitted to dry until the final rendering is applied.

After the plaster has sufficiently hardened cement slurry with cream like consistency shall be applied as thinly and evenly and rubbed to a fine condition. The finished surface shall be cured with water for a minimum period of 14 days.

Should the mortar crack or perish, the work shall be removed and redone at the contractors expense or should contractor fails to cure the work to the satisfaction of the Engineer-in-charge the latter may cure the work at the risk and cost of the contractor. All portions which sound hallow when tapped of found to be soft or otherwise defective shall be cut out in regular shape and redone as directed by the Engineer-in-Charge.

Pointing to R.R. Masonry Cement Mortar Mix 1:3

Preparation of Surface :

The joints in the masonry shall be raked out to a depth not less than the width of the joint or as directed when the mortar is green. Joints shall be brushed clean of dust and loose particles with a stiff brush. The area shall then be washed and the joint thoroughly wetted before pointing is commenced.

Flush pointing with cement mortar mix 1:4 for Random Rubble Masonry

The pointing to be done shall be flush pointing with cement mortar 1:4 (one cement, four sand by volume). The mortar shall be pressed into the raked out joints according to the type of pointing required. The mortar shall not be spread over the corners, edges or surface of the masonry. The pointing shall then be finished as detailed below. The mortar shall be finished off flush and level with the edges of the stones, so as to give a smooth appearance. The edges shall be neatly trimmed with a trowel and a straight edge. When finished the mortar pointing shall be restricted to the width of the joints and all superfluous mortar shall be removed with a trowel. The work shall be executed as rapidly as possible (and not again touched after it has begun to set) and kept wet for a minimum period of 14 days thereafter. The pointing shall also be cured for 14 days thereafter. The pointing shall also be cured for 14 days.

CHILD LABOUR ERADICATION ACT.

(G.O.Ms.No:53/Labour and employment (U2) Department/Dated.12.05.2003.

"The work contract assigned to the contractors shall be cancelled if they engage child labour in executing works and such contractors should be black listed for three years".

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SPECIAL CONDITION for implementaion of goods and service tax (gst) in works contract

1. GST RATES FOR WORKS CONTRACT

1. Government of India have notified vide Notification No. 20/2017 – Central Tax (Rate), Dated: 22nd August, 2017 and NotificationNo.24/2017 _ Central Tax (Rate), dated: 21st September, 2017, the concessional rate of the Goods and Services Tax (GST) at 12% (CGST at 6% + SGST at 6%) is leviable for any Government contract, whether Civil or Electrical, irrespective of the Goods and Services Tax (GST) rate applicable on purchase of goods used in the execution of Government Contract.

   And the GST amount will be calculated at 12% from the sum of total tendered value quoted by the tenderer for construction cost (including GST) specified in the BOQ, Subject to GST rate applicable from time to time as recommended by the GST council.

The Central Goods and Service Act 2017, the State Goods and Service Act 2017 and the Integrated Goods and Service Act 2017 were all enacted with effect from 01.07.2017. This work which will be carried out after 01.07.2017 will naturally come under the new tax regime. In this connection, the government have issued the following G.O's.

1) G.O Ms.No.296.Dated:09.6.2017
2) G.O Ms.No.264.Dated:15.09.2017

Therefore the contractor for this work is supposed to follow and fulfill the latest GST-G.Os, rules and Guidelines issued by the government in future also. In that case, this contract document will also be binding to that G.Os, rules and Guidelines.

2. INPUT TAX CREDIT (ITC)

a) As per Notification 202, dated: 29.06.2017 and as per sub – Section (2) of Section 7 of the Tamil Nadu Goods and Services Act, 2017, (Tamil Nadu Act 19 0f 2017), activities or transactions undertaken by State Government shall be treated neither as supply of goods nor a supply of service.

b) As per Chapter IX (Section 41) of the Tamil Nadu Goods and Services Act, 2017, every registered person may be entitled to take the credit of eligible input tax, as self – assessed, in his return and such amount shall be credited on a provisional basis to his electronic credit ledger.

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3. PAYMENT

After the bill payment including GST, the Contractor should pay the GST Amount to Government through his GST Registration No. Also the contractor needs to submit the Material purchase bill mentioning the name of the work/s in the package and GST No. to the Employer/Engineer.

(a) First Bill Payment:

"At the time of payment for first running account bill, the contractor should produce the GST paid details on goods (Materials) to the Employer/Engineer for ITC."

(b) Intermediate Bill Payment:

"At the time of payment for next running account bills, the contractor should produce the GST paid details of services upto previous bill payment (i.e. GST paid details for the previous work bill) along with Input Tax Credit (ITC) availed at the time of payment of intermediate bill to the Employer/Engineer.

(c) Final Bill Payment:

"The Contractor should produce the GST paid details for all the materials used for construction work and GST paid details of services for the upto previous payment (i.e. GST paid detail for the upto previous work bill) to the Employer/Engineer along with Input Tax Credit (ITC) availed at the time of payment of final bill to the employer."

(d) Submission of GST paid details of Final Bill :

"The GST paid details for the final work bill payment of construction work to be submitted by the contractor to the Employer/Engineer in few days after getting payment."

4. Goods and Services Tax (GST) Registration and Addition of GST in Bills:

The Contractor should be required to submit their GST Registration Number under the Goods and Services Tax (GST) Act 2017. The Central Goods and Services (CGST) Act 2017, the Integrated Goods and Services (IGST) Act 2017 and the Tamil Nadu Goods and Services (TNGST) Act 2017 have been enacted and enforced from 01.07.2017. Under the new tax regime, GST (comprising CGST, SGST and IGST) on works contracts for Government work was finally notified at 12 percent. As per the Tamil Nadu Goods and Services (TNGST)Act 2017, with effect from 01.07.2017.

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5. GST – TDS – Applicability and Procedure for Deduction

Tax Deduction at Sources of TDS 2% (STDS 1% + CTDS 1%) is a tax collection system wherein the tax liability is paid in part by the recipient of the goods or Service at the time of making payment to the contractor. TDS ensures that the responsibility for payment of GST is shared by both the contractor and employer for certain transactions. Hence, TDS ensures regular cash flow to the Government introduces check and balances prevents tax evasion and increases tax base.

The TDS will be deducted for the contract value more than Rs. 2,50,000/- (Rupees Two Lakhs and Fifty thousand) only. The GST TDS will be deposited to the Government by the Employer\Engineer. The TDS will be treated as input tax credit. The Contractor can use the same for payment of tax or any other liability.

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CHAPTER III

3.1 Detailed activities under the scope of works are as follows:

3.1.1 Fabricating, Supplying and Erection of screw Gearing stainless steel shutters

Fabricating, Supplying and Erection of screw Gearing stainless steel shutters , each shutter having a size 2.30 x 1.44m consists of skin plate made out of 10mm thick stainless steel plate (316LGR) and horizontally siffened with four rows of 150 x 75 mm stainless steel joist (316LGR) and vertical stiffeners made out of 150 x 10 mm (316LGR) SS Flat at an interval not more than 0.60m and end verticals made up of 150 x 12 mm (316LGR) SS plates 2NOS on both side provided with 150mm dia (316LGR) rollers 2Nos on both side with 2 2 dia gun metal bushes and 2" dia roller pin for smooth operation. The Shutter lifted with 12mm thick (316LGR) gusset plate required size on both sides fastened with SS bolts and nuts etc. Providing leakage arrest by using 75 x40mm(316LGR) channel sandwiched with "Z" type rubber seal covered 65x8 flat holded with bolt and nut arrangements made stainless steel pipe at both ends for required height welded with top of the shutter, the bottom seal made up of 75x10mm flat rubber seal covered with 65x8mm (316LGR) Flats fastened with required SS bolts and nuts. The shutter Groove angle made up of 200x200x8mm stainless steel angle for required height of two numbers on both sides including welding hold fast of size 50x50x6mm angle 3Nos on both sides. The groove angle weld with sill beam made out of MS beam 150x75mm RSI of length of required and the SS plate of size 75x6mm welded in the top of the sill beam. Fixing the angle to the grooves in proper alignment and Position. The of screw rod made up of 80mm dia stainless steel (316LGR) duly machined and fully threaded to suit the worm gear box and provided with required holes. Fixing the screw rod to the shutters gusset plate with required bolt and nut in proper alignment to the gear box.. The cost includes cost of all materials, cost of consumables like welding, rods, grinding wheel, oxygen & acetylene gas, diesel & oil for generator, process charges like gas cutting, welding, labour charges for dismantling, loading, lifting, unloading, transport, erection, hire charges for equipments like chain pulley block, welding machine, cutting set, grinding machine, power charges for generator, INCLUDING ALL TRANSPORTATION and conveyance to site and clearing them after completion of work, including cost of trial operation. Design, fabrication, supply & erection of MS deck bridge suitable for vertical gate arrangements of size 3000 x 2400mm,. The deck bridge shall be made with main girder in ISMB 200, base plate & bearings plate of 12mm thick. The anchor rods shall be made with 20mm dia ms rod and cross girders with ISMC 50. The handrail and connecting angles shall be done with ISA 65 x 65 x8mm. The handrail pipes shall be made with 25mm dia ms pipe and chequred plate shall be 6mm thick. The cost includes cost of all materials, cost of consumables like welding rods, grinding wheels, oxygen & acetylene gas, diesel & oil for generator, process charges like gas cutting, welding, labour charges for dismantling, loading, lifting, unloading, transport, erection, hire charges for equipments like derrick, chain pulley block, power charges for generator, conveyance to site and clearing them .after completion of work, complete as directed by the departmental officers. Design, fabrication, and installation of electrical hoisting arrangement for operate the shutter. The hoisting arrangement consist of 3HP reversible induction motor of 1440 RPM, reduction gear box for to reduce to required speed and torque, Starter box, sub panel board, main changeover panel ,etc,. the electrical actuator were connected with required proper wiring and proving change over for external EB line The cost includes cost of all materials, cost of consumables like welding rods, grinding wheels, oxygen & acetylene gas, diesel & oil for generator, process charges like gas cutting, welding, labour charges for dismantling, loading, lifting, unloading, transport, erection, hire charges for equipments like derrick, chain pulley block, power charges for generator, conveyance to site and clearing them after completion of work etc., complete as directed by the departmental officers. including cost of trial operation. with the warranty period for 5years. The Rate Excluding CGST and SGST.

3.1.2 40 KVA diesel generator set Engine

Supply of 1 No. 40 KVA diesel generator set Engine is water cooled diesel engine suitable for generator application with a shaft output of BHP - 156 at 1500 rpm. The engine Shall comprise the following standed scope of supply: (Kirloskar/Cummins/ Ashok leyland/equivalent) The generator engine should contain Dry type air cleaner, Expansion bllow, Radiator with fan mounting, Air to air charge cooler, Exhast gas turbo charger Lube oil Cooler, Lube oil filter, Fuel filter (pre and Micro) In-line mono-block fuel injection pump with Electronic Governor, 2Nos of 12V Battery charging alternator 12 Volt electric starter motor, Residential Mufler, Fly wheel with starter ring, Engine control panel consisting of ON/OFF/START key, Lube oil pressure gauge, gague and electronic hour meter and RPM indicator and safety system of engine, AMF control panel, Acoustic Enclosure, Acoustic enclosure shall be powder coated and fabricated out of 16 SWG CRCA MS sheet. The silent canopy shall be of nut bolt type construction it should be painted with Surface treatment painting. The Base frame is fabricated in sheet metal, The base frame is rugged in construction and designed for mounting engine and brush less alternator close coupled, with crossmebers mounted on AVM. The base frame shall have provision for mounting of acoustic enclosure on it. The supply of gen set includes loading unloding and transportation charges The Fuel Tank 60 Ltrs. Removable Fuel tank shall be fabricated out of 1.6mm CRCA MS sheet and is part of base frame. It is duly painted and fitted with inlet and outlet connections and mechnical fuel gauge. Fuel tank can be easily removed for cleaning or any maintenance. vent breather and gauge etc., and as directed by the departmental officer, with the warranty period for 5years. Excluding of GST (Rate as per SOR 2021-22, Annexure-VII, Electrocal Items, Item No.9 h Page No.146.)

STEEL AND IRON WORK

3.1 General :

This specification will include governing clauses on the supply and delivery fabrication and erection at site, of all materials covered by cast iron, wrought iron, and steel, employed for structural purposes, shown on the relevant drawings and described and described in the supplementary specifications and schedules.

3.1.1 All materials must strictly conform to relevant specifications, and proof thereof is to be furnished if so required to the Engineer-in-Charge.

3.1.2 The work includes all bolts, nuts, washers and field rivets required for complete erection at site together with an allowance for waste etc., upto 10 percent (unless otherwise specified in the schedule) on net- number of bolts, nuts, washers and field rivets required.

In addition to the above, the contractor is to supply all service bolts and nuts and ordinary plates, washers necessary for erecting the work at site.

3.1.3 For design of steel sections, Part VI Section 6 of N.B, Code and I.S. 800/2007 shall apply.

3.2 Quality :- (1) Regarding quality relevant I.S. shall apply
Especially I.S. 800/2007 and N.B. code Part VI – Section 6.

3.2.1 As regards "Tests" relevant I.S. shall apply 9.5.2 Tensile strength of rivet bars : Regarding the Tensile strength of rivet bars paragraph 9.1 to 9.2.1 in I.S. 1148 – 1964 shall apply.

3.2.2 Regarding measurement of steel work and iron work-relevant I.S. 1200 (Part VIII) 1967 shall apply Extract from I.S. 226-1969

Specification for Structural Steel

3.3 Tensile Test

3.4 Number or Tensile Tests

3.4.1 Plates, Sections (Angles, Tees, Beams, channels and lasts, etc.,) :
One tensile test shall be made from finished steel for every 40 tones or Para thereof from each cast a separate test being made for each class of steel product (namely plates, sections and flats) rolled from a cast.

3.4.2 Where plates, sections, or flats of more than once thickness are rolled from the same cast, one additional tensile test shall be made from the material in each class of product for each variation in thickness of 6 mm above or below the thickness of the test piece first selected in such a class.

3.4.3 Bars (round, square, and hexagonal) : one tensile test shall be made from finished steel for every 40 tones or part thereof from each cast and for every class of product. When more than one diaMetre or thickness of the bar is specified, one additional tensile test shall be made for each diaMetre or thickness of the bar ordered if so desired by the purchases.

3.4.4 Tensile test pieces : The tensile strength, yield stress and percentage elongation of steel shall be determined from standard test pieces cut length wise or cross wise from plates and length wise from sections, plats and bars. The tests shall be carried out on Indian Standard test pieces prepared in accordance with I.S. 1603 – 1960.

3.4.5 Tensile Test the Tensile strength yield stress and percentage elongation, when determined in accordance with I.S. 1608 – 1960 shall be as given in Table 1.

Table 1. Mechanical Properties of Structural steel

Standard Quality)

(Clause – 10 – 3)

Class of Steel Product	Nominal thickness DiaMetre in mm	Tensile strength Kgf/mm^2	Yield stress Min	Percentage elongation Min gauge
Plates, Sections (for example, trees, angles beams, channels, etc) and flits	Below 6	*Bend test Only shall be Required		
	6 upto and including 20	42 to 54	26.0	23
	Over 20 upto and including 40	42 to 54	23.0	23
	Over 40	42 to 54	23.0	23
Bar (round, square and hexagonal)	Below 10	+Bend test Only shall be Required		
	10 upto and including 20	42 to 54	26.0	23
	Over 20	42 of 54	24.0	23

3.4.6 In case of sections, the thickness of which is not uniform throughout the profile, the limits shall be applied according to the actual maximum thickness of the piece selected for test.

3.4.7 Should a tensile test piece break outside the middle half of its gauge length (see I.S. 1608 – 1960) and the percentage elongation obtained is less than that specified the test may be discarded at the manufactures option, and another test made from the same plate, section, flat or bar.

Note : Gauge lengths more than 5.65/S may also be used, in which case the elongation shall be read form I.S. 3803 – 1967. "Methods for elongation conversions for steel".

* Incase of the plates, sections and flats below 6 mm, the yield stress shall be assumed to be at least the same as that for the thickness between 6 and 20mm.
+ In case of bars below 10mm diaMetre , the yield stress shall be assumed to be at least the same as or bars of diaMetre between 10 to 20 mm.

3.5 Bend Test :

Bend Test shall be conducted accordance with I.S. 1599 – 1960.

3.5.1 For bend test except in the case of round bars 25mm in diaMetre and under, the test piece when cold shall without fracture be doubled over, either by pressure or by blows from the hammer, until the internal diaMetre is not greater than three times the thickness of the piece, and the sides are paralled.

3.5.2 In the case of round bars 25 mm in diaMetre and under the internal diaMetre of the bend shall be not greater than twice the diaMetre of the bar.

EXTRACT FROM I.S. 1148 – 1968

Specifications for rivet bars for structural purposes.

3.6 Tensile Test :-

3.6.1 One Tensile test shall be made from the finished steel for every 6.000Kg of caps iron or part thereof.

3.6.2 All loose, burned or otherwise defective rivets shall be cut out and replaced before the structure is loaded and special care shall be taken to inspect all single riveted connections.

3.6.3 Special care shall be taken in heating and drilling long rivets.

Welding

3.7 Welding shall be in accordance with any of the following standards as appropriate.

I.S. 816 – 1956 – Code of Practice for use of metal is welding for light assemblies in mild steel.
I.S. 819 – 1957 – Code of Practice for resistance spot welding for light assemblies in mild steel
I.S. 822 – Code of Practice for inspection of welds.
I.S. 823 – Procedure code for metal are welding of mild steel.
I.S. 1024 – Code of Practice for welding of structures subject to dynamic loading

3.8 Dimensions unless otherwise stated all work shall be measured not in deemed system, as fixed in is place as given in 22.5.1 to 22.5.3.

3.9 Dimensions excepting cross sections and thickness of plate shall be measured to nearest 0.001 in except for reinforcement which shall be measured to nearest 0.005 m.

3.9.1 Areas excluding cross – sectional measurements shall be worked out to nearest 0.001m.

3.9.2 Weights shall be worked out to nearest 1 Kg.

3.9.3 Mill tolerance shall be ignored when the weight is determined by calculation.

3.9.4 The printing cost shall be described and included in item of fabrication.

3.10 Steel Work

3.10.1 Various items of steel work shall be classified and measured separately under following categories work in each classification shall be described. Bolted, riveted and welded structures shall be described as such and measured separately.

(a) Rolled sections (hoist, channels, angles or tee) fixed independently without connecting plates.

(b) Rolled sections fixed with connecting plate or angle cleats as in main and cross-beams hip and jack, rafters, purloins connected to common rafters and the like.

ERECTION:

The equipment covered by these specifications shall be furnished and erected by the contractor at the project site. The contractor shall be required to furnish all erection drawings.

The contractor shall prepare a complete erection procedure, which shall describe the sequence of operations to be carried out, the method to be used, the measurements to be taken out and the tolerances to be met, in transaction and alignment of the equipment. Such procedure shall have the approval of the purchaser prior to the commencement of fabrication and when approved shall form a part of the specification furnished by the contractor. The contractor shall have to proceed the works from both flanks as directed by Engineer and erection shall follow sequence of construction of Barrage structures.

WASTAGE OF STEEL:

All the wastage of steel sections and rolling margin allowances of steel sections supplied by the main producers will be on contractor's account and the contractor should consider this aspect while quoting the rates. The weight of nuts, bolts, rivets, welding etc., will not be considered in the net weight of items of gates, hoisting bridge etc.

TOOLS AND TACKLES:

The contractor shall provide all tools and tackles to be used in the above said works.

SPECIAL CONDITION

1. The following special conditions of contract shall supplement the conditions of contract. Wherever there is a conflict the provision herein shall prevail over the conditions of contract and/or those elsewhere.

2. The Tenderder should inspect the site and quarries and satisfy himself about the availability of the quality and quantity of materials required for the work and leads for the materials.

3. The contractor shall make his own arrangement to procure all materials required for the work.

4. The contractor should make his own arrangement for water supply, for works and drinking purpose, at his own cost.

5. The contractor shall make his own arrangements to obtain electricity for his consumption on the works, at his own cost.

6. Temporary works

   (i) All costs and charges on temporary works will be borne by the contractor.

   (ii) All the approach roads, ramps, platforms, stacking yards required for the construction of the work shall be formed by the contractor at his own cost and no payment will be made by the Engineer.

7. All royalty and senior age charge on materials procured and Government quarries shall be borne by the contractor.

8. No plot rent shall be charged for materials stacked on Government land during the course of construction provided that all such materials are removed within one month after the work is completed.

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CHAPTER- IV

GATES & IT'S HOISTING MECHANISMS , RUBBER SEALS , PAINTING, ETC., FOR REGULATOR AND SCREW GEARING SHUTTERS

TABLE OF CONTENTS

4.1.0 SCOPE:

The broad scope of work includes the following.

4.1.1 Supply, fabrication, inspection, measurement, assembly.

4.1.2 Transportation and handling, site storage, erection, testing and commissioning including provision of labour, plant and materials for the above.

4.1.3 Dismantling, overhauling, repairing, reconditioning / replacement and reassembling including alignments for the above said equipments.

4.1.4 Cleaning and lubricating the equipments.

4.1.5 Trouble free satisfactory operation of the above system without vibration and abnormal sound.

4.1.6 Cleaning and painting of the Equipments.

4.2.0 SPECIFICATIONS:

4.2.1 The contractor should have experience in structural fabrication & fabrication of dam gate or maintenance of Dam gates related work.

4.2.2 The M.S. materials should be of Grade IS 2062 Gr. B of a reputed manufacturer.

4.2.3 In the bulk supply of M.S. material, a sample has to be tested for its material composition in a reputed Material testing laboratory at the contractors cost and the result should match with that of manufacturer's certificate.

4.2.4 The welding electrodes to be used are of E 7018 of reputed make suitable for joining steel of IS 2602 Grade B or approved by BHEL.

4.2.5 The new welding length should be same as that of the existing old welding length and all fillet weld thickness shall not be less than 6 mm..

4.2.6 The spherical roller bearings & Ball bearings should be of SKF or equivalent. Each bearing should be supplied with tamper proof sealed packing along with pre despatch inspection certificate.

4.2.7 The CSK SS bolts, GI sleeve, Hexagonal SS bolt & nut ,seal cover plate, bottom support plate of seal material etc., required for renewal of Top, side and bottom rubber seal of gate are to be supplied with IS by the contractor.

4.2.8 Any other consumables and materials required for the completion of the work which are not specifically mentioned in the tender has to be borne by the tenderer.

4.2.9 Reconditioning of C.S. rollers and its EN 8 shaft with required spare like bearing, oil seals, spacer rings are to be carried out as per the drawing by means of metal building by welding and machining.

Details of components

(i). Gate rollers
(i) Bottom rollers
(ii) Side rollers
(iii) Rope pulley
(iv) Filler valves

4.3.0 MATERIALS:

4.3.1 All the materials shall be of tested quality, new, unused, free from defects and of the grade / classification envisaged in the designs. The contractor shall furnish the test certificate for each lot of material, if so required by the purchaser. Plates with laminations discovered during welding or during inspection shall be rejected. Materials not supplied according to the approved designs / drawings shall be rejected, removed and replaced. Approval of purchaser shall not relieve the tenderer from the responsibility of supply of suitable materials. Recommended materials for some of the components are appended below.

In the bulk supply of M.S. material, a sample has to be tested for its material composition in a reputed Material testing laboratory at the contractors cost and the result should match with that of manufacturer's certificate. Contractor shall furnish to the purchaser/ Engineer duplicate copies of all Mill orders covering the materials ordered by him for this project and also the test reports received from the mills for Purchaser's / Engineer's check and information.

4.3.2 Applicable Codes and Specifications

Sl. No.	Component	Recommended Material	Conforming to Standards
1.	All structural members for Trestles, hoist Bridge, Skin plate, Stiffeners, and horizontal girders seal base and etc.,	Structural Steel	IS: 2062 – 2006 E-250 Grade B
2.	Guide rollers	Cast Steel	IS: 1030
3.	Seal Seat	Stain less Steel	IS: 1570 (part V) (or latest edition)
4.	Bushing	Phosphorus Bronze	IS: 305 – 1981 (or latest Edition)
5.	Rubber Seal	Natural Rubber	IS: 11855
6.	Wheel	Cast Iron / Forged steel	IS: 1030/ IS: 2004
7.	Wheel Track	Stainless Steel	IS: 1570 part V
8.	Sockets for wire ropes	Forged steel	IS: 2004
9.	Lifting Lugs	Structural Steel	IS: 2062 E-250 GR-B
10.	Gears	Cast Steel Forged Steel	IS: 1030 IS: 2062 – 2006
11	Electric Motors		IS 325/ 1075
12.	Pinions	Carbon Steel / Forged Steel	IS: 1875 IS : 2004

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13.	Shafts	Mild Steel	IS: 2062 –2006 / IS: 2062 E-250 GR-B
14.	Pulleys, Couplings	Cast steel	IS: 1030
15.	Bolts and Nuts	Mild Steel	IS: 1363
16.	Keys and cotters	Mild Steel	IS: 2291 IS: 2048 IS: 2292
17.	Bearings : P.bin bearing Roller tapered Roller bearing	Leaded Bronze/EN8	IS: 318 SKF, FAG, NTN or equivalent
18.	Equaliser Bars and turn buckles	Mild Steel	I- IS: 2062 E-250 GR-B
19.	Covers, Pedestals	steel	IS: 2062 -
20.	Retainers	Structural Steel	IS: 2062 E-250 GRADE - B
21.	Sleeves for pin(distance piece)	Corrosion resistant steel or structural steel with chromium hard plated	IS: 1570 (5) Gr.15 Cr 13
22.	Guide roller	Cast steel	IS :1030 Gr. 27 – 54 / 28-52
23.	Guide roller pin	Corrosion resistant steel	IS: 1570 (5) Gr. 20Cr.13/30cr13
24.	Track		IS: 1570 (5) Gr.20 Cr.13/30cr13
25.	Wheel pins	Corrosion resistant steel	IS: 1570 (5) Gr.20 Cr.13/30cr13
26.	Painting - Primer	Epoxy	IS: 14177, IS:1477 (Part) – I, IS: 1477 (Part) – II, IS:2339, IS:2932
27.	Painting – Finishing	Coaltar Epoxy	IS: 14177, IS:1477 (Part) – I, IS: 1477 (Part) – II, IS:2339, IS:2932

4.3.3 Standards for Design & Testing

Following is the list of Indian Standard Specifications. The latest Edition of these standards (except for IS 807-1976) shall be followed wherever the detailed requirements have not been outlined in these specifications:

Description	**Standard**
Recommendation of structural design of fixed wheel gates.	IS: 4622
Recommendations for structural design criteria for low head slide gates.	IS: 5620
Code of practice for design of rope drum and chain hoists for hydraulic gates.	IS: 6938

Code of practice for design, manufacture, erection & testing of cranes & hoists.	IS: 807-1976
Code of practice for use of structural steel in general building construction.	IS: 800
Overhauling hoisting mechanism	IS: 10096(Part 3)
Recommendation for inspection, testing & maintenance of fixed wheel & slide gates.	IS: 7718
Covered Electrodes for the Manual Metal Arc Welding of Mild steel and Medium Tensile Steel.	I.S: 639
Specification for Mild Steel covered Arc welding Electrodes	AWS A - 5.1
Approval test for welding procedures	IS: 7307 (Part I)
Approval testing of welders working to approved welding procedures	IS: 7310 (Part l)
Approval tests for welders when welding procedures approval is not required.	IS: 7318
Code of practice for liquid penetrateflow detector.	IS: 3658
Code of practice for Ultrasonic tube echo testing by contact and immersion methods.	IS: 3664
Code of practice for magneticflow detector.	IS: 3703
Code of practice for radiographic testing.	IS: 2595
Code of practice for structural safety of buildings loading Standard.	IS: 875
Code of practice for plain &reinforced concrete.	IS: 456
Criteria for Earthquake resistant design of structures	IS: 1893
Specification for Covered Electrodes for Metal Arc welding for Mild Steel.	I.S: 814
Technical supply conditions for threaded Fasteners.	I.S: 1367
General Requirements for Rubber Seals for Hydraulic Gates	IS: 11855
Rubber Seals for Hydraulic Gates - Specification	IS: 15466
Guidelines for Painting Systems of Hydraulic Gates & Hoists	IS: 14177, IS: 1477, IS:2339, IS:2932
Hand Operated Chain Pulley Blocks - Specifications	IS: 3832 - 2005
Pulley steel beam, channel & Angle Sections	I.S: 808

Reference should be made only to the relevant Indian Standard Specification. However, where such code is silent on certain specific provision, reference may be made to other appropriate & relevant ASTM, ASME, DIN, JIS, BS IEC, JIS, or EN.

Standards other than those stipulated in the Tender documents shall be acceptable after scrutiny provided they ensure equal or higher quality than those specified in the specifications. The contractor shall submit for approval the detailed standards, which he proposes to use.

It shall be confirmed by the contractor that in case the standards proposed by him are not found acceptable by employer during engineering, conformance of the offered equipment to the respective standards as specified in the Tender documents shall be ensured by him at no extra cost to the employer.

If these specifications conflict in any way with any of the above standards or codes, these specifications and drawings shall take precedence.

It is not intention of the purchaser that all the steel materials to be supplied by contractor for the work shall be specially purchased from the rolling mills. Also all such materials supplied by contractor shall be in a sound condition, of recent manufacture, free from defects, loose mill scale, slag intrusions, laminations, pitting, flaky rust etc. and be of full weight thickness specified.

All steel materials such as steel plates, structural members, handrails, bolts, nuts screws and Composite chequered plate and hoist cover and all consumables, bought out items etc. Required for fabrication, supply erection and satisfactory commissioning of the gates and its associated equipment, structures as per specification are to be procured by the contractor at his cost and the quoted rates shall be inclusive of all materials. The suppliers shall furnish test certificates issued by the manufacturers for the steel materials while supplying the relevant component item of work contemplated under the contract.

The tenderer shall furnish clearly in their tender the type of steel plates and structurals, they proposed to use for the skin plate of the gate and other members. The tenderer shall also furhish the approximate weight of each component, namely, embedded parts, gates etc and calculation of hoist capacity and self closing of gate considering counter weight.

4.3.4 Castings

While making patterns for the castings, care shall be taken to avoid sharp corners or abrupt changes in cross section and ample filets shall be used.

All castings shall be true to patterns and the thickness of the metal shall not vary at any point by \more than 5mm from that shown in the drawings. Care shall be taken in the foundry to cool the castings properly so that they will not warp or twist. No castings will be accepted of it is warped or twisted to such an extent that machined surfaces cannot be properly finished to the dimensions shown on the drawings.

All castings shall be sound, clean free from cracks, holes or sand holes and other defects. These shall have a workman like finish Castings shall not be repaired, plugged or welded without the permission of the purchaser. Such permission shall be given only when the defects are small and do not affect the strength, use or machinability of the castings. No welding shall be done after the castings are finally annealed. No defect shall be removed and paint or oil be applied to the surface of any casting until it has been inspected by the purchaser or his authorized representative. The treatment for casting involves heating slowly upto a temperature of about 40 degree C above its upper critical temperature holding it at the temperature just only long enough for a uniform temperature to be attained throughout the casting and then allowing it to cool slowly in furnace. During the process the requisite annealing temperature shall not exceed and over heating shall be avoided. End products shall conform to the requirements of relevant Indian Standard. All castings shall be ultrasonically tested to ascertain soundness of castings. Acceptance criteria as specified by the purchaser shall be binding to contractor.

4.3.5 Forgings

All forgings shall be done in accordance with the latest practice and shall exhibit physical and chemical properties envisaged in the corresponding Indian Standards. Only those forgings shall be used whose working is well known without doubt.

4.3.6 It is not intention of the purchaser that all the steel materials to be supplied by contractor for the work shall be specially purchased from the rolling mills. Contractor's stock material may be used provided the mill test reports identified with the materials, satisfactorily demonstrate specified grade and quality. Also all such materials supplied by contractor shall be in a sound condition, of recent manufacture, free from defects, loose mill scale, slag intrusions, laminations, pitting, flaky rust etc. and be of full weight thickness specified.

4.3.7 All steel materials such as steel plates, structural members, chequered plates, handrails, bolts, nuts screws and all consumables bought out items etc. Required for fabrication, supply erection and satisfactory commissioning of the gates and its associated equipments, structures as per specification are to be procured by the contractor at his cost and the quoted rates shall be inclusive of all materials. The suppliers shall furnish test certificates issued by the manufacturers for the steel materials while supplying the relevant component item of work contemplated under the contract.

4.4.0 ANCHOR BOLTS AND BASE PLATES:

Embedded anchor bolts shall be carefully positioned for proper attachment to the non-embedded items. The fixing of embedment into the existing structure is to be done with minimum disturbance to the structure. For this, special anchoring method, if any, could be adopted. Anchor bolts and other incidental items of structural steel to be embedded or built into concrete or masonry shall be delivered at the site at the proper time, as may be specified by the PURCHASER from time to time.

4.5.0 EMBEDDED METAL WORK:

Embedded metal work shall be accurately set in place at the time concrete is placed or recesses shall be left in the concrete and the metal workplaced,anchored and grouted in place after the structure concrete has set.Where it is impracticable to place anchors, or anchor bolts, holes shall be drilled by the CONTRACTOR in the concrete for expansion bolts and such bolts shall be installed as directed by the ENGINEER.

4.6.0 MANUFACTURE:

All the works shall be performed and completed in a through workman - like manner as per the best modern practice in the manufacture and fabrication of materials of the types covered by these specifications. The work shall in all cases be of high grade and carefully performed to the satisfaction of the authorized representative of the purchaser. The tenderer shall warrant all materials and workmanship furnished by him to be free from injurious and defective materials or workmanship and shall bear all cost of repair in case of any error for which he is responsible. Workmanship shall conform to the relevant standards laid down by the bureau of Indian standards. All sharp comers, which can damage the matching parts, shall be rounded and shall be chamfered, if required.

4.7.0 TOLERANCES:

The dimensional and weight tolerances for rolled shapes shall be in accordance with I.S:1852 and or ASTM A6.No rolled or fabricated members shall deviate from straightness by more than 1 / 1000 of the axial length or 10 mm whichever is smaller.

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The length of members with both ends finished for contact shall have a tolerances of+1 mm.

Members without ends finished for contact bearing shall have a tolerance of + 5 mm for members up to 10 Metre s long and a tolerance of 3 mm for members over 10 Metre s in length.

Lateral deviation between centre line of web plate and centre line of flange plate at a contact surface, in the case of built up sections shall not exceed 3 mm.

The combined warpage and tilt of flanges in welded built up sections shall not exceed 1 / 200 th of the flange width or 3 mm whichever is smaller.

The deviation from flatness if welded plate girder web in the length between stiffeners or a length equal to the depth of the girder shall not exceed 1 / 150 of such length.

Deviations from the specified depth of welded girders measured at the centre line of the web shall not exceed + 3 mm up to a depth of 1000 mm, + 5 mm for depths above 1000 mm up to 2000 mm and +8 mm and – 5 mm for depths over 2000 mm.

4.8.0 MACHINE FINISH:

Where finished surfaces are not specified on the drawing, the type of finish, shall be that most suitable for the part to which it applies and shall be as per IS:3037 (latest edition).

A smooth finish (two delta I, e., 1.6 to 6.3 microns 0 will be required for all surfaces in sliding or rolling contact and for surfaces in permanent contact, where a tight joint is required. A finish (single delta i, e., 6.3 microns 0 shall be given to all other machined surfaces where selective assembly for matching parts shall be ground if necessary, to obtain the limiting tolerances.

4.9.0 FABRICATION OF STRUCTURAL STEEL:

The contractors are supposed to perform fabrication in the best possible manner to meet the requirements of designs and drawings. However some specific guidelines are appended herein.

4.10.0 STRAIGHTENING OF MEMBERS:

Before being laid off or worked in any manner, structural steel shall be straight without twists, bends or kinks and if straightening is necessary, it shall be done by a method which shall not injure the metal to ensure good welding and fittings of members. All steel shall be cleared of dirt, mill scale and rust prior to fabrication. Heating or forging shall not be restored to without prior approval of Engineer in writing. Long plates shall be straightened by passing through a mangle or levelling rolls and structural shapes by the use of mechanical or hydraulic bar straightening machine.

4.11.0 SHEARING, CHIPPING AND GAS CUTTING:

Shearing, chipping and gas cutting shall be performed carefully and all portion of the work which will be exposed to view shall present a neat appearance. Finishing of sheared or cut edges of plates or shapes will not be required except as noted in these specification.

4.12.0 EDGES TO BE WELDED:

The edges of plates and shapes to be joined by welding shall be properly formed to suit the type of welding selected. Where plates and shapes have been sheared, edges to be joined by welding shall be machined or chipped to sound metal. Plates and shapes to be field welded shall have their edges prepared in the shop for the type of weld selected.

4.13.0 BENT AND SHAPES:

Where bending or forming of plates or shapes is required, the plates or shapes be bent by cold forming. Heating and hammering to correct bends will not be permitted.

4.14.0 CONNECTIONS:

Shop connections as well as field connection shall be effected either by welding or black bolts or any approved methods.

High tensile bolts where specified shall comply with the requirements of B.S.1083 R Quality or its equivalent on I.S.:1367.

Where necessary tapered washers or flat washers or spring washers shall be used with bolts. In case of high strength friction grip bolts hardened washers shall be used under the nuts or the heads depending upon whether, the nuts or the heads are turned to tighten the bolts. The length of the bolt shall be such that at least one thread of the bolt projects beyond the nut except in case of high strength friction grip bolts where this projection shall be at least three times the thread pitch.

In all cases where bearing is critical, the unthreaded bolt shall bear on the members assembled. A washer of adequate thickness may be provided to exclude the threads from the bearing thickness, if a longer grip bolt has to be used for this purpose. All connection and splices shall be designed for full strength of members or leads indicated unless otherwise approved. Column splices designed for the full tensile strength of the minimum cross section at the splice.

Unless otherwise noted, beam end connections shall be designed for a minimum of 60% of the shear capacity of the beam section plus additional axial forces, if any shown on drawings.

4.15.0 WELDING:

4.16.0 WELDING TECHNIQUE:

Care shall be taken in designs that the welds when being made are well accessible. Overhead welding is to be avoided, of possible and flat position is to be strived for.

Drawings should clearly indicate the joining position, shop or field welding, kind of welding, method or welding, welding sizes and other required points. Symbols to be shown on the drawing should conform to relevant Indian Standards.

All welding electrodes required shall be furnished by the contractor. Correct selection of electrodes shall be done taking due care of welding method and base metals of components. The welding Electrodes shall be of the heavily coated type designed for all position welding.

The surface to be welded shall be cleared of scale, slag, rust, paint and other foreign matter, except that thin coat of linseed oil need not be removed before welding. Where weld metal is deposited in two or more layers, each layer shall be cleaned with a wire brush or otherwise cleaned before the subsequent layer is deposited. In welding, precautions shall be taken to minimize stresses due to heat by using the proper sequence in welding.Upon completion, the welds shall be brushed with wire brush and shall show uniform section smoothness as of weld metal. Edges and ends of fillets and butt joint welds shall indicate good fusion and penetration into base metals. Specific requirements for butt joints and fillet joints are given below.

4.17.0 BUTT JOINTS:

In principle, butt joints should be made with back run. Should it be not possible to do the back – run either a backing strap should be placed or welding should be so made that the melted metal fully penetrates to the backing strap or the side butt welding should be executed so that the melted metal reaches the back of the groove and a full penetration is achieved.

4.18.0 FILLET JOINTS:

All fillet welds shall be continuous. For the main members no fillet welding should be made on members whose thickness differs substantially. Fillet weld at ' T ' joints should be made, as a rule on each side of the joint, unless it is otherwise stated due to some practical reasons. Radiographic test is not normally required for fillet welds. 20 % to 30 % of the fillet weld shall be checked by dye – penetrate test.

4.19.0 QUALIFICATIONS OF WELDING PROCESS:

A specification of the welding process that is proposed to be used shall be establishment and recorded and, if required a copy of such specification together with a certified copy of report of results of tests made in accordance with the process and specifications shall be furnished.

The qualification of the welding process shall be at least equal to that required by 'Standard Qualification Procedure' of the Indian Standards and the minimum requirement of the tests shall be at least as stated in the said, 'Standard Qualification Procedure'.

4.20.0 QUALIFICATION OF WELDERS:

The contractor shall be responsible for the quality of the work performed by his welding staff. All welders assigned to the work shall have qualification tests for welders. If at any time the work of any welder appears questionable, the welder shall be required to pass additional qualification tests to determine his ability to perform the type of work on which he is engaged.

4.21.0 TESTS AND INSPECTION OF WELDING:

4.22.0 LIQUID PENETRATION TEST:

In the case of weld examined by liquid penetration inspection such tests shall be carried out in accordance with the ASTME – 165 or IS. 3650. All defects shown shall be repaired and rectified.

4.23.0 RADIOGRAPHIC INSPECTION OR ULTRASONIC TEST:

More than 12mm thick plates butt welds shall be radiographed in accordance with the recommended practice for radiograph testing or ultrasonic tests to be carried out as per relevant specification and as directed by the Engineer at site.

4.24.0 DIMENSIONS, WORKMANSHIP AND CLEANLINESS:

The structural steel members shall be inspected at all stages of fabrication and assembly to verify that dimension tolerances, alignment and surface finish, painting where specified are in accordance with requirements shown on contractors approved drawings. Contractor shall maintain records of all inspection and testing which shall be made available to Engineer or his authorized representative.

4.25.0 INSPECTION OF WELDS:

All welds shall be inspected for flaws by any of the methods described under clause inspection. The choice of the method adopted shall be determined by the purchaser.The correction of defective welds shall be carried out as directed by the Engineer without damaging the parent metal. When a crack in the weld is removed and prescribed by the Engineer shall be used to ensure that the whole of the cracks and material up to 25mm beyond such and of the crack has been removed. Cost of all such tests and operations incidental to correction shall be to the contractor's account.

4.26.0 CUTTING:

Cutting may be by shearing, cropping sawing or machine flame cutting as permitted by the Engineer. All re – entrant corners shall be shaped notch free to a radius of at least 12mm sheared or cropped edges shall be dressed to a neat workman like finish and shall be free from distertar and burrs. The kerf on machine flame cut shall be removed

where machine flame cutting is permitted for high tensile steel special care shall be removed by machine / edge placing.

Hand flame cutting shall be undertaken only if so permitted by Engineer and shall only be carried out by an expert in such work. Hand flame cut edges shall be ground smooth and straight.

Edge planning of sheared cropped or gas cut edges are such as to arrant or specifically called for.

4.27.0 TURNED AND FITTED BOLTS:

In cases where bolts have to be used but strength of a riveted connected is required, this can be obtained by using special bolts in special holes to a driving fit. The bolts are specially made from black round bars and turned down to the exact diaMetre . The inside of the head and flat face of the nut should be machined. The hole must be accurately drilled or reamed with a clearance of not more than 0.25mm. The holes after assembly of the parts must be true throughout the thickness of all parts and perpendicular to axis of the member. Washers for turned and fitted bolts should be machined on both faces.

4.28.0 DRILLING AND REAMING:

Holes shall be accurately located and drilled or reamed perpendicular to the face of the member and, if necessary, shall be drilled to a template. Counter – sunk, where required, shall be done carefully and to the full depth of head. Open holes in material of 18mm or less in thickness, shall be sub – drilled or sub – punched before assembly and reamed during assembly. Holes in structural steel of more than 18mm in thickness shall be drilled 3mm smaller than the normal diaMetre of the rivet or bolt, before assembly and reamed to the full size during assembly. All members shall be shop assembled before reaming or drilling holes for field connections.

Where reamed members are taken apart for handling, the respective pieces reamed together shall be so marked that they may be reassembled in the same position in the final setting up. No interchange of reamed parts will be permitted. Poor matching, over drilling, and ovality in holes shall be a cause for rejection. Burning holes with gas is strictly prohibited.

4.29.0 INSTALLATION OF GATE LEAVES AND HOISTS:

It is desirable to avoid the flood period to perform erection of gates. Should it be necessary to do so, due precautions should be taken against floods, since the gates may be submerged in water sustaining damages, or the half erected gates may disturb the water flow causing damages to the civil structures.

The other may be to have assembly yard at a high position so that the flooding water may have no effect on the erection work. All the components of the gates and hoists shall be erected perfectly, giving due cognizance of the unit and match marks on the components. All components designed to fit – snugly – and to water tight shall be assembled to ensure water tightness.

4.30.0 ERECTION PERSONNEL:

Required number of skilled as well as unskilled personnel shall be arranged by the contractor for fabrication and erection of the equipment covered in these specifications. For marking at site and for checking up alignment etc, the services of surveyor shall be provided by Tender der.

4.31.0 METHOD OF MEASUREMENTS:

The weight of the actual, completed structures shall be calculated from the approved drawing for different items of work in respect of structural steel and on No, basis in respect of Gate leaves.

Weights of bolts and rivets shall not be taken into account in calculating the weight of the completed structure. No allowances shall be permitted for galvanizing, welding or for rolling margins and wastage. One tonne shall mean One Metric Tonne (i.e) 1000Kg.

The weights of members made out of standard rolled section such as beam, channels, angles etc. shall be based on the standard I.S. Book. Weight of member, without deduction for holes, notches, level cuts etc., where a component consists of a cut joist or channel the full weight of the rolled section shall be considered only if more than half the depth of the section is used. Otherwise only half the section unit weight shall be considered for calculation of the weight of the component.

Deductions shall be made in the weight of gussets / plates for skew cuts and notches of 900 sq cm or longer. The weight of any built up member shall be separated into weight of each component.

For rolled sections, rails, flats the length shall be taken as the distance between places normal to the axis of the member passing through the extreme points of the section. In other words the edges shall be assumed to be cut square.

For gussets used in trusses, bracings etc. area shall be that of minimum circumscribing rectangle except as stated in clause above.

Erection bolts installed by erector may be left in position on completion of erection. However no additional payment shall be made either for supply or use of such bolts. If erection bolts are removed after erection is complete, holes shall be plug welded and ground smooth. No extra payment shall be made for such plug welding.

4.32.0 FAILURE TO MEET GUARANTEE:

Should any part of equipment fail to meet the guarantee or other requirements of the purchaser may reject the equipment or may direct the contractor to proceed at once to make alterations to the existing parts and of tests made necessary at the cost of the contractor to meet the guarantee and other requirements of the specification. If after due notice, the contractor refuses or persistently neglect to correct any defect, error, omission or any other failure of the apparatus to meet the requirements of the specifications, which might develop during the guarantee period, the purchaser may process to correct such defects, errors,

omissions or failure and deduct from payments or money due to the contractor an amount equal to the actual expenses so incurred.

4.33.0 DEFECTIVE EQUIPMENT:

In case any part of the equipment / component is found to be defective in materials or workmanship or develops defects or does not otherwise meet the requirements of the specifications including errors or omissions on the part of the contractor the following shall apply.

4.34.0 DEFECTS DISCLOSED PRIOR TO FINAL ACCEPTENCE:

Any defect in materials or workmanship or other failure to meet the requirements of the specifications including errors or omission on the part of the contract, which are disclosed prior to final payment or prior to final acceptance tests, whichever occurs at a later date shall if so directed by the purchaser, be corrected entirely at the expense of the contractor.

4.35.0 DEFECTS DISCLOSED AFTER FINAL ACCEPTANCE:

Any latent defects not disclosed before date of final acceptance shall be corrected promptly by the contractor entirely at his expense provided that the total period during which the contractor is liable for replacement due to latent defects shall not exceed Sixty months after date of final acceptance of the equipment.

4.36.0 OPERATION OF UNSATISFACTORY EQUIPEMENT:

If the operation of the equipment after the installation proves to be satisfactory to the purchaser, the purchaser shall have the right to operate and use the equipment, while unsatisfactory articles can be taken out of service for correction of latent defects, errors or omissions provided that the period of such operation of any use pending the correction of latent defects, errors or omissions shall not exceed twelve months without mutual consent of the contractor and the purchaser.

4.37.0 ASSEMBLY AND TESTING

Gate shall be assembled, complete with wheels and guides, either in horizontal or vertical position for proper alignment and inspection.

Side guide shoes or guide rollers may be shimmed, if necessary, to maintain the required tolerances.

13.36.3All the wheels of the gate shall be rotated a number of times to ensure their free movement.

If ballast is provided, it should be ensured that it is placed in correct position and secured to avoid dislodging during operation of the gate.

The marking and match marking on the components should be made.

Any weld that might have become defective should be chipped out and remade.

Damaged nuts, bolts, rivets, screws etc should be replaced.

The gate slot and platform should be cleaned. Scales formed over the embedded parts should be removed.

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All bottom corners should be cleaned and accumulations, removed. Anchorages and concrete around anchorages should be checked for any developing cracks or slackness, etc, and repair should be attended.

The gate leaf should be thoroughly cleaned and repainted as per recommended by IS .

Rubber seals should be ground, if required to keep it in one alignment.

All nuts and bolts fixing the seal to the gate should be tightened uniformly.

Gate roller bearings and guide roller bushes should be properly lubricated, if necessary these should be opened for rectifications of defects; and after cleaning and lubrication, Should be 'refitted. These may be replaced if repairs are not possible.

All nuts, bolts, check nuts and cotter pins of the lifting devices should be checked. Where filling valves are provided as part of the gate structure, all the nuts, bolts, check nut set should be checked and defects if any should be rectified.

It shall also be ensured that the filling valves completely shut-off the passage of water when the load is removed.

To ensure the springs and other components should be checked and replaced if necessary.

All components should be cleaned, greased and lubricated according to code of provisions and use only recommended and approved oils and grease.

The roller assembly should be adjusted by the eccentricity arrangement to ensure that all the rollers rest uniformly on the track plates, particularly in the closed position of the gate.

In closed position, the gate must be completely water tight with full pressure acting from upstream side and sealing must be reliable against maximum water level.

The sealing of the wheel assemblies should prevent entry of water to the wheel bearings to ensure trouble free operation.

The clearance between guide rollers/ guide shoes and guide is within the prescribed limits and the gate travels smoothly in the groove up and down without excessive sway throughout the travel.

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CHAPTER-V

WIRE ROPE

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5.1.0 SCOPE

5.1.1 The scope of this section comprises of supply , fixing, greasing ,testing and commissioning for the new steel wire rope after dismantling the damaged wire rope and cleaning ,greasing ,testing and commissioning of the existing wire rope as per Indian Standard. The work under this specification shall consist of furnishing of all materials, tools & plants, labour, transportation and everything necessary for carrying out the work.

5.1.2 The works shall be executed generally as per the specification and as directed by the Engineer at site.

5.1.3 For details not covered in these Specifications, relevant IS code shall be referred to. All references to BIS-Specifications and codes are with amendments issued up to date i.e. till the date of call of tender.

5.2.0 APPLICABLE CODES AND SPECIFICATIONS

Supply , fixing, greasing ,testing and commissioning of new steel wire rope and cleaning, greasing, testing and commissioning of the existing wire rope in accordance with the latest Indian standard Specification.

The wire ropes shall generally conform to IS: 1855, IS: 2266 and IS: 2365, 1S 6938:2005 and as indicated in Annexure 'A'.

IS: 11793-1986 : Guidelines for design of float driven hoisting mechanism for automatic gated control.

IS: 6938-2005 : Code of practice for design of rope drums and chain hoists for hydraulic gates.

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IS: 807-2006 : Code of practice for design, manufacture, erection & testing of cranes and hoists.

IS: 7718-1991 : Code of Practice for inspection ,testing and maintenance of wheel and slide gate

IS: 10096-2002 : Code of Practice for inspection ,testing and (part3) maintenance of radial gates and rope drum hoists.

5.3.0 STANDARDS:

The design, material, construction manufacture, testing and performance of these wire ropes shall comply with all currently applicable statues regulations and safety codes. The steel wire rope shall generally conform to IS: 1855, IS:2266 and IS:2365 with amendments up to date.

5.4.0 MATERIALS AND WORKMANSHIP:

5.4.1 The steel wire ropes supplied shall be new, unused and originally coming from manufacturer's plant to the destination stores. Used materials will not be accepted.

5.4.2 The wire rope shall be made from improved plough steel, galvanized (if required), Lang's lay and fibre core or normally of 6 x 36 or 6 x 37 construction or if required specific standards and shall conform to 1S : 2266.

5.4.3 All the materials shall be of the best class and capable of satisfactory operation of the tropics with humid atmospheric conditions without distortion or deterioration. Unless otherwise specified, the equipment shall conform to the requirements of the appropriate Indian standards.

5.4.4 For calculating the rope tension pulley efficiency should be taken into account. In case of multiple falls, the wire rope shall be provided with a device that takes care of unequal stretch of rape.

Breaking Strength: The breaking strength of wire rope, if not given by the manufacturer of rope, shall be calculated on the basis of IS 2266.

5.4.5 Factor of Safety:

5.4.6 The minimum factor of safety based on minimum

breaking strength and safe working load of the wire rope shall be as given below

Minimum Factor of Safety for Wire Ropes

S1 No.	Operating Condition	Minimum Factor of Safety
i)	Normal operation condition	6
ii)	Breakdown torque condition	3
iii)	For counterweight suspension	5

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5.4.7 The strength of the socket end of wire rope shall be approximately equal to that of the rope itself. The ends of wire ropes shall also be secured against twisting. The material for wire rope socket shall conform to S2485.

5.4.8 The workmanship shall be of the highest grade and the entire construction in accordance with the best modern practice. The whole of the work shall be of the highest class throughout well finished and of approved make. The entire design and construction shall be capable of withstanding the severest stresses likely to occur in actual service and of resisting rough handing during transport.

5.4.9 The steel wire ropes should be designed to facilitate inspection to ensure satisfactory operation under atmospheric conditions prevailing at site and under sudden variations of load as may be met with under working conditions in the system.

5.4.10 The design shall incorporate every reasonable precaution and provisions for the safety of all those concerned in the operation and maintenance.

5.5.0 TECHNICAL SPECIFICATION:

Detailed technical specification is enclosed as per Annexure 'A'. The total length required and no. of pieces are indicated. It should be noted that each single piece indicated shall be supplied without joints.

5.6.0 LUBRICATION:

The rope shall be lubricated in the manufacturing stage with a suitable compound which will thoroughly protect the rope both internally and externally to minimize rust corrosion, until the rope is put into service as per IS: 1855, IS: 2266 and IS: 2365.

5.7.0 TESTS ON WIRE ROPE :

a) Measuring of dia. Of wire rope
b) Measuring of pitch length of wire rope
c) Tensile test of wire
d) Wrap test of wire
e) Minimum breaking load test
f) Torsion test
g) 180 reverse bend test

All relevant tests are to be carried out at company's works to satisfy that the materials conform to the requirement of this order.

5.8.0 TEST CERTIFICATES:

The test certificate for the materials furnished the results of the tests as per latest issue of IS/BS or any other relevant International Standard as applicable shall be produced. The materials may be rejected if the test results are not satisfactory.

5.9.0 PACKING AND FORWARDING :

Steel wire ropes shall be securely packed so as to withstand handling during transport & subsequent storage. The packing may be in accordance with the manufacture's standard practice. The Supplier is responsible for ascertaining the facilities that exist for Road Transport to site. Each package shall be clearly marked and contain detailed packing list, such as gross weight, net weight etc. The supplier is solely responsible for any loss or damage during transport. Proper instructions for storage at site may also be furnished to the consignee well in advance.

5.10.0 ROPE SIZE AND TOLERANCE:

The size of the rope designated as 'nominal diaMetre '. The actual diaMetre of the rope as supplied shall be within +4_l percent of the nominal DiaMetre .

Steel Core Steel core shall be as per IS 6594.

For ascertaining the conformity of a lot,

a) Dimensional checking — 100 percent
b) Breaking force test — one sample from a lot Should be made

5.11.0 GUARANTEE:

5.11.1 The entire materials shall be guaranteed for satisfactory operation and good workmanship for a period of 18 months from the date of receipt of the materials at TANGEDCO's stores or 12 months from the date of commissioning whichever is later with an overall period of 24 (Twenty four) months from the date of receipt of last consignment of materials in good condition at destination sites. Supplier shall furnish an undertaking for the above.

5.11.2 Any defects noticed during this period shall be rectified free of cost to the TANGEDCO

within 2 (Two) months from the intimation of defect/ failure. Irrespective of number of failure and repairs, the suppliers are responsible for free replacement of the defective materials till the same serves a continuous period of 12 (Twelve) months from the date of receipt of last consignment of materials, whichever is LATER. If they are not rectified or replaced within this period the supplier shall pay Liquidated Damages as per Liquidated Damages clause in the contract for the delay from the date of receipt of intimation for the defects or failures.

5.11.3 The incidental expenses, insurance and freight charges for the replacement of defective materials within the guarantee period shall also be borne by the supplier till such time it serves a continuous period of 12 (Twelve) months as said above after last repairs

5.11.4 The suppliers shall guarantee among other things, the following:

(i) Quality and strength of materials used.

(ii) Safe mechanical stresses on all parts of the steel wire ropes under all specified conditions.

(iii) Performance figures given by the suppliers in the Schedule of Guaranteed technical particulars.

(iv) Replacement of parts which become defective under proper use.

ANNEXURE `A`
TECHNICAL SPECIFICATION OF WIRE ROPES FOR GATES

Sl. No	Description	Intake gate	Scour vent gate	Spill way gate
1.	DiaMetre	As per specification	As per specification	As per specification
2.	Length Required	As per specification	As per specification	As per specification
3.	Construction	6 x 19 Filler (12/6+6F/1)	6 x 19 Filler (12/6+6F/1)	6 x 19 Filler (12/6+6F/1)
4.	Tensile Strength @ Rope Gr 1770	192 KN	192 KN	192 KN
5.	Lay	Longs Lay right Hand	Longs Lay right Hand	Longs Lay right Hand
6.	Fabrication	Preformed	Preformed	Preformed
7.	Type of Core	Fibre core	Fibre core	Fibre core
8.	Type	6 x 19 Filler Preformed	6 x 19 Filler preformed	6 x 19 Filler preformed
9.	No. of Strands	6/19	6/19	6/19
10.	Purpose	Intake Purposes	Scour vent Purposes	Spillway gate Purposes
11.	Ultimate Strength	As per IS 2365	As per IS 2365	As per IS 2365

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5.12.1 FOR FIXING AND COMMISSIONING OF NEW WIRE ROPE:

5.12.1 The ends of the rope shall be fixed at minimum two points on the drum in such a way that the fixing device is easily accessible and the rope is not subjected to undue twists and turns.

5.12.2 Each rope shall have not less than two full turns on the drum before it is fixed.

5.12.3 The performance of the wire rope will be checked by operating the gate depending on the site condition.

5.12.4 All bolts and nuts , clamps ,etc., at rope end in drum & gate Leaf should be fixed and tightened properly by new one ,if necessary.

5.12.5 As per the specification, relevant compound / lubricant (Servo coat 120/140/190) may be applied to the rope properly .

5.13.1 FOR RE-GREASING THE EXISTING WIRE ROPE:

5.13.1 The wire rope to the entire length should be cleaned properly free from rust and dried grease using wire brush ,kerosene , cotton waste ,etc., without damaging the rope as per specification.

5.13.2 Hoisting connection on the gate leaf should be cleaned and lubricated where

5.13.3 necessary and defects if any should be rectified.

5.13.4 All bolts and nuts , clamps ,etc., at rope end fixed in drum & gate Leaf should be checked and tightened properly if necessary.

5.13.5 Rope dimensions at varies location to be measured for the entire length after cleaning and recorded properly in the presence of Engineer in charge.

5.13.6 As per the specification, relevant compound / lubricant (Servo coat 120/140/190) may be applied to the rope properly .

5.13.7 Cleaning the floor area free from spilled rope grease after completion of re-greasing works.

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CHAPTER- VI

ACCEPTANCE TESTS

6.1 General

After the equipment has been installed in the field, it will be operated and tested as per technical specification requirement. The gate shall be raised and lowered several times for full length of travel. The primary requisite to acceptance shall be that each gate shall operate smoothly and water tight / leak proof as per norms and to the satisfaction of project authority ,Testing of gates and Hoisting equipment shall be carried out as per INDIAN STANDARD IS:7718 and IS : 6938

6.2 Functional Tests

Functional tests shall be defined as tests of the function of assemblies, subassemblies or parts of the facilities under no load conditions. Functional tests shall be performed on all facilities prior to the execution of operational tests.

6.3 Operational Tests

As far as practicable operational test shall be carried out on all facilities (in complete assemble condition at manufacturer's workshop if possible otherwise at site), simulating operating conditions as agreed by Engineer-in-Charge.

The contractor shall carry out in the presence of project authorities such tests on the gate equipment to determine that the gates will fulfil the functions for which they have been designed. Tests shall be repeated, if necessary, until successfully carried out to the satisfactions of the purchaser. Leakage tests and operation tests shall be carried out at the convenience of the project authorities after completion of other portions of the work and when the reservoir is at its full level, the project authorities shall have the right to carry our such tests also when the reservoir is at a level other than the full reservoir level. All lubricants necessary for initial testing of gate should be supplied free of cost by the contractor.

Before testing the Contractor shall submit a notice containing full information on the tests with detailed tables or graphs on the latest edition of the characteristic values to be adopted for test and on the test procedures and equipment.

Operational tests of hoist / crane, lifting equipment and other machinery shall include tests under full load unless otherwise specified in Technical Specifications.

6.4 Insulation tests

The following tests shall be carried out at shop or at site after erection.

i) After erection but before the hoist/crane is connected to the supply, the insulation of the electrical equipment shall be tested by a suitable instrument and any defects revealed shall be rectified. The voltage required for the insulation resistance test shall be D. C. voltage not less than twice the rated voltage.

ii) Any reading less than 0.5 mega ohm obtained with an insulation resistance tester of the un-regulated type shall be disregarded and the wiring under test shall be sub-divided until a reading higher than 0.5 mega ohm is obtained. Failure to obtain a higher reading shows an unsatisfactory state of insulation. If an installation has been sub-divided for test purposes, each sub-division shall meet the requirement.

iii) The insulation resistance of each wiring circuit exclusive of connected apparatus shall be not less than 2 mega ohm. If necessary, it shall be permissible to disconnect individual items of equipment while making this test.

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6.5 Electrical Tests

Electrical Facilities shall be tested in accordance with applicable Standards and agreed test programs and procedures. Testing of the electrical facilities shall be performed in accordance with applicable Standards, they shall include but not be limited to tests or heating, loading, overloading, losses. However before the complete installation is put to commercial service, tests shall be carried out to ascertain the following:

i) The satisfactory operation of each controller, switches contactors, relays and other control devices and in particular the correct operation of all limit switches under the most unfavourable conditions.

ii) The correctness of all circuits and interlocks and sequence of operation.

iii) Satisfactory operation of all protective devices.

The measurement shall not be taken on the first application of the load.

6.6 Site Inspection and Tests

During erection, commissioning and trial operation the Contractor shall organise at suitable intervals all inspections and tests in the presence of the Engineer in Charge, in order to prove the orderly execution of the facilities in accordance with the Contract.

Unless otherwise specified, all costs for testing at site and of the work and charges associated with it shall be borne by the Contractor. This includes the measuring devices (properly calibrated) and any pertinent accessories, which shall be made available by the Contractor for the entire duration of the tests. The Contractor shall delegate his experts to supervise the tests at site.

The tests, checks, examinations at site shall comprise but not be limited to:

- Checks and examinations of welds
- Tightness tests
- Dielectric tests
- Functional checks (on all operating mechanism, on protective devices, automatic and manual controls, monitoring, supervisory equipment etc.)
- Running tests
- load tests (on hoists)
- Performance tests and determination of characteristic data
- Any other tests to ensure the correctness of work and smoothness of operation

All such tests and checks shall be performed in the presence of the Engineer in Charge. If not satisfied with the performance of the tests and checks the Engineer in Charge shall have the liberty to ask for additional tests or repetition of same.

The testing at Site shall be complete in every respect to prove the successful performance and operation of all the facilities supplied and erected under the Contract.

6.7 Commissioning and Trial Run

After the contractor has notified the Engineer in Charge and received his agreement that the equipment is ready for the commissioning tests.

The tests shall comprise the following stages:

a) Pre-commissioning Tests

b) Commissioning Tests

c) Trial Operation

6.7.1 Pre-Commissioning Tests

Pre-Commissioning Tests shall include the appropriate inspections and (dry or cold) functional tests to demonstrate that each item of Plant can safely undertake the next stage.

6.7.1 (a) Stage inspection at site

- Requirement of IS 7718 & IS 10096 shall be covered. Inspection of embedded parts duly assembled/ erected in location, fully aligned and adjusted including installation of sill beam, side guide members, sill seats/ tracks/ bearing pads and hoist supporting structure. This inspection involves measurement of critical dimensions, verticality, co-plainerness of sealing/ bearing surfaces and dimensional accuracy within permissible erection tolerances.
- Prior to concreting, it shall be ensured that the embedded parts which have been erected/ aligned and inspected are supported by additional bracing etc. so that they do not get disturbed during concreting.
- After concreting, critical dimensions of embedded parts shall again be inspected for clearances of any excess concreting require chipping etc.
- Inspection of gate at site after its complete assembly and checking of dimensional accuracy, critical dimensions, co- planer ness of skin plate and bearing / sealing faces.
- Inspection of structural components of hoist support, their dimensional accuracy, corrects location and rigidity.

  Inspection of hoist over the lifting point of the gate and for proper matching and connections.

6.7.1 (b) Final Checking and Testing at Site

General

After completion of various phases of work final checking of the entire facility shall be done, by the contractor to ensure that all the equipment erection and wiring etc. have been done strictly according to the specification drawings and as approved by the Engineer-in-charge. All the facilities shall be thoroughly inspected keeping in view the following main points:

- Check for completion of all facilities in accordance with specifications and drawings.
- Checking of alignment of all mating components.
- Checks for correctness of connections, continuity check, insulation resistance test
- Checks, adjustment and characteristic test of all controls/ protective equipment in accordance with manufacturer's instructions.
- Setting and calibration of components e.g. relays, control , etc.
- Checking of equipment for proper mechanical adjustment and proper operation.
- All routine and pre-commissioning tests and any other special tests required to be conducted at site on each and every equipment as per relevant standards and manufacturer's instructions and recommendations.
- All other tests as specified under relevant standards and codes of practice but not mentioned here
- Functional tests/ checks for various components.
- Tests & commissioning of control panels.

Proper record shall be maintained for all visual inspections, settings and checks carried out.

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For Hoist

- Ensuring completion of all component parts in accordance with the drawings.
- Ensuring proper lubrication of all components.
- Functional test of various assemblies including hoisting mechanism, unloading mechanism etc.

Dry Testing of Gate & Hoist

Operational tests in dry shall be carried out as soon as possible after completion of erection where all controls and permanent power supply have been connected. The tests shall include at least two complete traverses from the maximum raised position to the full seating position. All adjustments, clearance, brakes etc., shall be checked for proper operation.

The dry testing of the gate and hoist shall be carried out generally in accordance with IS 7718 & IS 10096. The gate & hoist shall be functionally operated, fully closed, fully opened and it shall be ensured that there is no obstruction during the operation, the movements are smooth without any jerks and no undue effort is required for operation. Contact between gate seals and seal seats shall be checked and pre-compression ensured by viewing the contact surface against a light source. The operation of the hoist shall be smooth without any undue noise/ excessive friction and without excessive vibrations in the gate, hoist and supporting structure. The operation of hydraulic hoist shall be without any increase in oil pressure beyond design limits and motor current shall be within design value.

IMPORTANT: Any 'Dry' testing movements should have Rubber seals & seal faces lubricated with WATER (Do not use grease / oil). For Metal-to-Metal sealing/ bearing surfaces grease will be used.

6.7.2 Commissioning Test

Commissioning tests which shall include the specified operational tests to demonstrate that the facilities or section can be operated safely and as specified, under all available operating conditions; and shall include:

- Satisfactory operation of all equipment, after erection.
- Satisfactory vibration and noise level during entire cycle of operation
- The testing of gate and hoist for aspects as per IS: 7718 & IS: 10096 shall be performed with water pressure against the gate (preferably up to design head). The maximum permissible leakage from gate shall be as per relevant IS Specifications.

  Leakage tests shall be carried out with the gates lowered on the sill. Before measuring the leakage, the gates shall be raised and lowered several times by a Metre or so in order to dislodge any debris that may have lodged in the side seal seats. The leakage shall then be measured and recorded. The maximum permissible leakage shall be 10 to 15 liters per minute per Metre length of seal.

6.7.3 Completion Certificate

As and when the whole of the work is completed to the satisfaction of the Engineer and in accordance with this contract Completion certificate will be given and there upon the purchaser shall take over the work. Completion certificate shall be issued by the Engineer-in-Charge after successful commissioning of the facility and performing acceptance tests as per above.

6.7.4 Trial Operation

After issue of completion certificate, trial operation shall commence which will demonstrate that the facilities or section perform safely & as specified with reliability during repeated operation and in accordance with the Contract.

During the trial operation period the Contractor may request any minor adjustments, which do not in any way, interfere with or prevent the use of the equipment by the Employer or result in reducing the output or decreasing the efficiency.

If any failure or interruption occurs in any portion of the equipment covered by the

Contract due to, or arising from, faulty design, materials, and workmanship (but not otherwise sufficient to prevent full use of the equipment the trial operation period is to recommence after the Contractor has remedied the cause of defect.

A certificate of suitability for Operation shall be signed by an authorized representative of the Engineer in Charge and the Contractor.

This Certificate shall state:

- The conditions of commissioning
- The names of the participants
- The date of commencement of trial run
- The list of minor defects, if any

During the trial run the Contractor shall make familiar the Engineer in Charge with the properties, the operation and maintenance of the facilitation and its auxiliaries to such extent that thereafter the duties can be assigned to the Employer's trained personnel.

The "Taking over certificate" certificate shall be issued thereafter.

6.7.5 Taking Over Of work

Immediately upon successful completion of trial operation, the taking-over of any Permanent facilitation shall be performed based on following protocol of acceptance.

- Confirmation of functional performance and Proper working of Equipment as per Technical Specifications and Employer's satisfaction.
- Mutual acceptance of results of test between the contractor and the owner/EIC.
- Submissions and Acceptance of all contract documents including Inspection and test records/ Test certificate carried out at "Facilities" and at "Site".
- Compliance of all defects and irregularities, which have to be corrected by the contractor.
- Confirmation that the Engineer in Charge has been familiarized with the facilities and that they will be able to operate and maintain the facilities.

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On confirmation of above, Taking over certificate of permanent facility shall be issued by the owner to contractor**:**

The final acceptance of equipment shall be based on the following:

a. Quality of workmanship and material of the equipment
b. Satisfactory operation of the equipment after erection as required under these specifications.
c. Acceptance of various tests or test certificate by the purchaser as mentioned above

6.7.6 Final Certificate

a) Work experience certificate shall be issue after completion of the work in all respects except maintenance in defect liability period i.e. 95% payment made.

b) The contract shall not be considered as complete until a certificate called Final Certificate shall have been signed by the Engineer to the effect that the contractor has carried out all the obligation under maintenance and in the manner provided by this contract without prejudice to the rights, duties and obligations of the parties during any part of maintenance period which has not expired at the time of the issued of final certificate.

6.7.7 Failure to Meet Guarantee

Should any part of equipment fail to meet the guarantee or other requirements of the purchaser may reject the equipment or may direct the contractor to proceed at once to make alterations to the existing parts and of tests made necessary at the cost of the contractor to meet the guarantee and other requirements of the specification. If after due notice, the contractor refuses or persistently neglect to correct any defect, error, omission or any other failure of the apparatus to meet the requirements of the specifications, which might develop during the guarantee period, the purchaser may process to correct such defects, errors, omissions or failure and deduct from payments due to the contractor an amount equal to the actual expenses so incurred.

6.7.8 DEFECTIVE EQUIPMENT:

In case any part of the equipment / component is found to be defective in materials or workmanship or develops defects or does not otherwise meet the requirements of the specifications including errors or omissions on the part of the contractor the following shall apply.

6.7.9 DEFECTS DISCLOSED PRIOR TO FINAL ACCEPTENCE:

Any defect in materials or workmanship or other failure to meet the requirements of the specifications including errors or omission on the part of the contract, which are disclosed prior to final payment or prior to final acceptance tests, whichever occurs at a later date shall if so directed by the purchaser, be corrected entirely at the expense of the contractor.

6.7.10 DEFECTS DISCLOSED AFTER FINAL ACCEPTANCE:

Any latent defects not disclosed before date of final acceptance shall be corrected promptly by the contractor entirely at his expense provided that the total period during which the contractor is liable for replacement due to latent defects shall not exceed 60 months after date of final acceptance of the equipment.

6.7.11 OPERATION OF UNSATISFACTORY EQUIPEMENT:

If the operation of the equipment after the installation proves to be satisfactory to the purchaser, the purchaser shall have the right to operate and use the equipment, while unsatisfactory articles can be taken out of service for correction of latent defects, errors or omissions provided that the period of such operation of any use pending the correction of latent defects, errors or omissions shall not exceed twelve months without mutual consent of the contractor and the purchaser.

CHAPTER- VII

RUBBER SEAL

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7.1.0 SCOPE

7.1.1 The scope of this section comprises of dismantling, fixing, aligning, testing and commissioning of the new rubber seal with new fastens as per specification.

7.1.2 The work under this specification shall consist of furnishing of all materials, tools & plants, labour, transportation and everything necessary for carrying out the work.

7.1.3 The works shall be executed generally as per the specification and as directed by the Engineer at site.

7.1.4 For details not covered in these Specifications, relevant IS code shall be referred to. All references to BIS-Specifications and codes are with amendments issued up to date i.e. till the date of call of tender.

7.3.0 APPLICABLE CODES AND TECHNICAL SPECIFICATIONS

Types and specification for rubber seals used for all common types of hydraulic gates. IS 15466-2004

SPECIFICATION FOR RUBBER SEALS:

Shore A diaMetre hardness 65 (+ or -5)	IS 3400 (Part 23) 2002
Elongation at break, percent, Min 450	IS 3400 (Part 1) : 1987
Tensile strength, N/mm2, Min 14.5	IS 3400 (Part 1) : 1987
Mass of water absorbed in 7 days, percent10,	IS3400 (Part 6): 1983
Low temperature brittleness Non brittle after 3 min – 40”C — A	

7.2.0 INITIAL INSPECTION

A visual inspection shall be made to assess the general condition of the seals & seal seats for cracks, broken welds and missing parts.

7.3.0 TYPES, SHAPES AND DIMENSIONS:

The length of the seal should preferably be in full length unless otherwise agreed by Engineer at site. All the comer seals should be fully moulded. The most common types of rubber seals used in gates are given below

i. Flat/wedge seals
ii. Single steam Musical note seal
iii. Double steam Musical note seal
iv. Double bulb seal
v. Corner seals:
vi. 'L' Type seal

The tolerance on sectional dimension of all seals shall be to 0.5 percent, however tolerance shall not apply to the thickness of cladding film.

The normal thickness of cladding should not be less than 1 mm.

SAMPLING:

Scale of sampling and criteria for the purpose of ascertaining conformity to the standard, the scale of sampling and criteria shall be produced before supplying the materials.

7.4.0 MARKING:

Each rubber seal or packing or both shall be marked indelibly with the:

a) manufacturer's name or trade-mark,
b) designation/Type of seal
c) Month and year of manufacture.

7.5.0 DISMANTLING OF THE WORNOUT / DAMAGED RUBBER SEAL

Remove the existing old damaged rubber seal, seal cover plate, seal bottom supports, bolt and nuts, etc., complete using gas cutting machineries and special tools & tackles without damaging the parent body of the gate.

7.6.0 FIXING OF RUBBER SEAL

After removing the rubber seal , the surface of seal seating area should be cleaned thoroughly as per standard.

The seal seating surface may be reconditioned by welding & grinding and additional plate provision if necessary as per Indian Standard.

The proper size holes in rubber seal should be provided by hallow punch as per specification.

The rubber seals for the gates to be fixed using new cover plate, bolt & nuts washer, etc., complete.

The tightening of bolt & nuts for the rubber seal assembly should be uniformly.

7.7.0 ALIGNING AND TESTING OF SEAL

The gate leakage should be arrested to the permissible limit by adjusting and aligning the rubber seal if necessary.

CHAPTER- VIII

PAINTING

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8.1.0 SCOPE:

This specification is for supply, cleaning and painting as detailed in technical specification.

8.2.0 TECHNICAL SPECIFICATION:

Indian standard guidelines for painting system for hydraulic gates and hoists as per is 14177 : 1994

All paints, painting materials and accessories for painting shall be supplied by the CONTRACTOR and shall be included in the price Tender . The paints proposed by the CONTRACTOR must be approved by the representative of the PURCHASER before application of the same. The analysis in respect of paint properties, paint composition and performance requirements of the paints shall be submitted by the CONTRACTOR for examination and approval.

8.3.0 PREPARATION OF SURFACE:

8.3.1 Surface preparation shall be in accordance with the following procedure:

8.3.2 Weld spatters or any other surface irregularity should be removed by any suitable means before cleaning.

8.3.3 All oil, grease and dirt shall be removed from the surface before blast cleaning.

8.3.4 Following the solvent cleaning, the surface, to be painted shall be cleaned of all rust, mill scale, and other light adhering objectionable substances by sand blasting or grit blasting to uniform bright base metal. Any grit or dust remaining after the cleaning operation shall be completely removed from the surface by wire brushing, air blowing suction or other effective means before the surface is painted.

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8.3.5 Surface of stainless steel, nickel, bronze and machined surface of adjacent to metal work being cleaned or painted shall be protected by masking tape or by other suitable means during the cleaning and painting operations.

8.3.6 Primers shall be applied as soon as the surface preparation is complete and prior to the development of surface rusting. In case there is considerable time gap, the surface should be reblasted prior to priming.

8.4.0 SHOP PAINTING DETAILS:

8.4.1 Stainless steel and bronze surface shall only be cleaned but not painted.

8.4.2 All surfaces of the embedded parts which are to come in contact with concrete shall be cleaned as mentioned above and give two coats of cement latex to prevent rusting during shipment and while awaiting installation.

8.4.3 GATES

Perfect cleaning of all surfaces which are not to be covered with concrete shall be carried out by sand blasting to the requirements of SA 2½ of Swedish Standard.

Over the prepared surfaces one coat of Epoxy zinc rich primer by spray (preferably airless spray) should be applied giving a dry film thickness of 40 -60 microns.

The interval between surface preparation and painting shall be as short as practicable and in no case longer than 4 – 8 hours. Over the primer, two coats of coaltar epoxy paint shall be provided at an interval of about 24 hours. Each coat shall give a dry film thickness of 100- 125 microns. The total dry film thickness of all the coats shall not be less than 300 microns.

8.4.4 EMBEDDED PARTS

All unfinished surfaces of embedded parts exposed to atmosphere or water shall be sand blasted to Sa 2½ of Swedish Standard and given a coat of zinc epoxy primer giving a dry film thickness of about 40-60 microns.

8.5.0 MEASURES DURING PAINTING:

8.5.1 Any bare spots or holes shall be recoated with additional application of primer

8.5.2 All runs, sags, or dips shall be removed by scrapping and cleaning. The cleaned area should be retouched or all such defects shall be remedied by reblasting or repriming.

8.5.3 Special attention should be given to good coverage on rivets, welds and sharp edges and covers.

8.5.4 Suitable measures shall be taken to protect the applied primer from contact with rain, fog, mist, dust or other foreign matter until completely hardened and next coat is applied.

8.5.5 The air temperature at the time of application must not be below 10^{o}C and relative humidity must not be above 90%.

8.6.0 APPLICATION PROCEDURES:

All paints and coating materials shall be in a homogeneously mixed condition at the time of application and shall not be thinned except as hereinafter specifically provided. All surfaces to which paint shall be applied immediately after cleaning, and except otherwise specifically provided, shall be applied by either brushing or by airless spray. When paint is applied in spraying a mechanical agitator type paint pot shall be used. Means shall be provided for removing all free oil and moisture from the air supply line of all spraying equipment. Each coat of paint shall completely cover the surfaces and shall be free from runs, sags, pinholes, and holidays. Each coat of paint shall be allowed to dry or harden thoroughly before the succeeding coat is applied. All paints shall be applied by skilled workers in a workman like manner. Paint shall not be applied during damp weather and on the surfaces which are not entirely free from moisture. Rust preventive compound shall be applied by any convenient method to ensure complete coverage of heavy coating. After the final application, the paint film shall be allowed to cure at least for 7 days.

8.7.0 FIELD PAINTING:

The painted metal work shall be handled with care so as to preserve the shop coats. The area of the shop paint, which has been damaged during transport/overhauling shall be cleared to base metal and repainted. Paint applied to such areas shall be of the same type as used originally in shop painting.

8.8.0 INSTRUCTION PLATES:

All gauges, Metre s and other instruments etc., shall have dials or scales calibrated in metric system. All name plates, instruction plates, warning signs etc., shall be in English. All markings to be used shall be submitted to the purchaser for approval before the equipment is marked or labelled.

8.9.0 TOOLS AND TACKLES:

The contractor shall provide all tools and tackles to be used in the above said works.

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CHAPTER- IX

OVERHAULING OF GATE HOIST BRAKE SYSTEM

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9.1.0 SCOPE

9.1.1 The scope of this section comprises of dismantling, overhauling, reassembling, testing and commissioning of existing gate hoist brake system.

9.1.2 The work under this specification shall consist of furnishing of all materials, tools & plants, labour, transportation and everything necessary for carrying out the work.

9.1.3 The works shall be executed generally as per the specification and as directed by the Engineer at site.

9.1.4 For details not covered in these Specifications, relevant IS code shall be referred to. All references to BIS-Specifications and codes are with amendments issued up to date i.e. till the date of call of tender.

9.2.0 APPLICABLE CODES AND SPECIFICATIONS

9.2.1 Gate hoist brake system shall be manufactured in accordance with the latest Indian Standard Specification current at the time of order, including amendments

IS: 11793-1986 : Guidelines for design of float driven Hoisting mechanism for automatic gated control.

IS: 6938-2005 : Code of practice for design of rope drum and chain hoists for hydraulic gates.

IS: 807-2006 : Code of practice for design, manufacture, erection &testing of cranes and hoists.

IS:3177-1999 : Code of Practice for electric overhead traveling cranes

9.3.0 INITIAL INSPECTION

9.3.1 Before carrying out the initial test on the brake to find out the defects:

9.3.2 A visual inspection shall be made to assess the general condition of the outside of the brake for cracks, broken welds and missing parts.

9.3.3 An insulation resistance test to ground shall be performed for the solenoid coil using 500 volts megger.

9.3.4 The plunger shall be manually moved to check for any obvious problems with the solenoid assembly.

9.3.5 If possible, brake may be operated at name plate voltage and check the conditions.

9.4.0 DISMANTLING OF BRAKE

9.4.1 After the initial inspection, the brake shall be dismantled to do the specified overhaul.

9.4.2 frames shall be clearly match-marked with numerals or letters.

9.4.3 Bolts and small parts shall be stored in dedicated containers.

9.4.4 If dowels or fitted bolts are used to ensure accurate fits, the location of these pieces shall be identified.

9.4.5 Care shall be taken to avoid damage to the coil.

9.4.6 Particular attention shall be paid to, and records kept of:

- The amount of rotor lift (end play);
- The axial and radial clearances (fit) to the shaft and housing;

9.5.0 OVERHAULING OF BRAKE

9.5.1 After dismantling, the solenoid coil shall be cleaned, dried and inspected.

9.5.2 Winding insulation resistance shall be tested at 500 volts DC.

9.5.3 If satisfactory levels are not attained, the coil shall be recleaned and dried thoroughly at a temperature not exceeding 90°C (195°F), and then retested.

9.5.4 The other components shall be cleaned with cleaning agents of approvedquality to remove heavy deposits of dirt and grease have been removed by scraping and wiping.

9.5.5 All components shall be thoroughly dried at a temperature less than 90°C (195°F), for as long as it takes to remove all signs of moisture. For coil, this will be indicated by the insulation resistance stabilizing after some hours of drying.

9.5.6 After satisfactory insulation resistance has been attained, all loose or damaged wedges, slot sticks, coil supports etc., shall be replaced or repaired.

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9.5.7 The coil shall then be given a dip-and-bake using a Class F or higher grade varnish.

9.5.8 The routine overhaul of other parts of the motor shall return the parts to good condition.

9.5.9 If th coil is found failed it shall be replaced with new coil of same make or any other reputed make of identical type.

9.5.10 The brake pads shall be checked for any wear and tear. If required it shall be replaced with new pads of same type satisfying the relevant IS specification.

9.5.11 Any parts that are to be reused shall be cleaned and examined for defects.

9.6.0 ASSEMBLY

9.6.1 Terminal boxes shall be returned to original condition. Missing bolts and gaskets for both the cover shall be replaced.

9.6.2 The assembly of the brake shall be the reverse of the disassembly process Match marks shall line up.

9.6.3 Dowels and fitted bolts shall go back into the same holes that they came from.

9.6.4 Where they can be measured, all air gaps shall be within 10 percent of the average.

9.6.5 The alignment of the brake shall be carried out to the relevant standard specification.

9.6.6 Lubrication shall be done for the moving parts with recommended quality of lubricants.

9.7.0 COMMISSIONING

9.7.1 The terminal cables and earth connections are restored as before dismantling.

9.7.2 The brake solenoid coil shall be tested for insulation resistance test using 500 volts DC megger.

9.7.3 After the insulation tests, the brake shall be operated for the healthiness.

9.7.4 The brake shall be adjusted for the full performance as per relevant standards.

9.8.0 PAINTING

9.8.1 Before putting into service, the brake shall have all parts coated with anti- rusting compound.

9.8.2 The brake system shall be painted with an approve manner using two coats, one undercoat and one finish coat to the Purchaser's Painting Specification and as per the instruction of the Engineer at site.

9.8.3 All surfaces of the brake system shall be thoroughly cleaned and degreased prior to painting.

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CHAPTER- X

OVERHAULING OF GATE HOIST MOTOR

TABLE OF CONTENTS

10.1.0 **SCOPE**

10.1.1 The scope of this section comprises of dismantling, overhauling, reassembling, testing and commissioning of existing gate hoist motors

10.1.2 The work under this specification shall consist of furnishing of all materials, tools &plants, labour, transportation and everything necessary for carrying out the work.

10.1.3 The works shall be executed generally as per the specification and as directed by the Engineer at site.

10.1.4 For details not covered in these Specifications, relevant IS code shall be referred to. All references to BIS-Specifications and codes are with amendments issued up to date i.e. till the date of call of tender.

10.2.0 APPLICABLE CODES AND SPECIFICATIONS

10.2.1 Motors shall be manufactured in accordance with the latest Indian Standard Specification current at the time of order, including amendments

IS 325 : Three phase induction motors
IS 4029 : Guide for testing 3 phase Induction Motors
IS 4691 : Degree of protection provided by enclosures for rotating electrical machinery
IS 4722 : Rotating electrical machines
IS 4728 : Terminal marking and direction of rotation for rotating Electrical machinery.
IS 4889 : Method of determination of efficiency of rotating electrical machines
IS 6362 : Methods of cooling for rotating electrical machines
IS 7816 : Guide for testing insulation resistance of rotating machines.
IS 8789 : Values of performance characteristics for 3 phase Inductionmotors
IS 12065 : Permissible limits of noise level for rotating electrical machines
IS 12075 : Mechanical vibration of rotating electrical machines with Shaft heights 56mm and higher-Measurement, evaluation and limits of vibration severity
IS 12802 : Temperature rise measurement of rotating electrical machines.
IS 13529 : Guide on effects of unbalanced voltages on the performance of three phase cage induction motors.

10.3.0 INITIAL INSPECTION

10.3.1 Before carrying out the initial test on the motor to find out the defects in the motor:

10.3.2 The intent of the initial tests shall be to determine and record the probable defects in the motor and to determine what work is required.

10.3.3 A visual inspection shall be made to assess the general condition of the outside of the motor for cracks, broken welds and missing parts.

10.3.4 An insulation resistance test to ground shall be performed, at a voltage suitable for the motor's voltage rating and the apparent condition of the motor. The initial test voltage shall be 500 volts DC.

10.3.5 For motors where there is more than one winding, the insulation shall also be tested between windings, at the test voltage appropriate to the lower voltage winding, with other windings grounded.

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10.3.6 The duration of the insulation test shall be one minute. The temperature shall be recorded properly.

10.3.7 The shaft shall be manually rotated to check for any obvious problems with the bearings or shaft.

10.3.8 If possible, the motor shall be run on no load, at name plate voltage and checked for balanced currents and vibration. The values shall be documented clearly.

10.4.0 DISMANTLING OF MOTOR

10.4.1 After the initial inspection, the motor shall be dismantled to the extent needed to either fully identify or repair the problem, or to do the specified overhaul.

10.4.2 End brackets and frames shall be clearly match-marked with numerals or letters.

10.4.3 Bolts and small parts shall be stored in dedicated containers and parts from other jobs shall not be kept with them.

10.4.4 If the motor has insulated bearings, note which, if any have the insulation deliberately bridged, the insulation resistance of each insulated bearing shall be at least 10 mega ohms with a 500 volt megger.

10.4.5 If dowels or fitted bolts are used to ensure accurate fits, the location of these pieces shall be identified and marked clearly.

10.4.6 Repairer must be certified for repair of motors. For motors certified for hazardous locations, extra care shall be taken to ensure that joints and flame paths are not damaged during the work. If damage requiring other than normal repair is found, purchaser shall be notified before proceeding with repair.

10.4.7 For horizontal motors where the shaft rotor assembly is too heavy to be removed easily by hand, one or two cranes shall be used to move the shaft, with a close fitting pipe installed over one end of the shaft to act as a shaft extension.

10.4.8 Care shall be taken that the slings do not damage the bearing surfaces or the rotor.

10.4.9 Under no circumstances shall the stator windings be touched by any of the parts being moved.

10.4.10 Vertical motors shall be dismantled according to the manufacturer's Instruction book. The assembly of vertical motors is critical.

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10.4.11 Particular attention shall be paid to, and records kept of:

- The amount of rotor lift (end play);
- The make and types of bearings, particularly the thrust bearings including orientation of thrust bearings;
- The arrangement of the thrust and guide bearings, including specially ground mating surfaces;
- The axial and radial clearances (fit) to the shaft and housing;
- The method of lubrication of both upper and lower bearings;
- The method of bearing insulation, if any; and
- Any other particular features of the motor configuration.

10.5.0 OVERHAULING OF STATOR

10.5.1 After dismantling, stator winding and cooling ducts shall be cleaned, dried and inspected /tested properly.

10.5.2 Winding insulation resistance shall be tested at 500 volts DC.

10.5.3 The duration of the test shall be one minute. The minimum acceptable level after one minute, corrected to a 40°C reference temperature per IEEE 43, is20mega ohms. Levels less than 20 megohms shall be discussed with the purchaser.

10.5.4 If satisfactory levels are not attained, the winding shall be re-cleaned and dried thoroughly at a temperature not exceeding 90°C (195°F), and then retested.

10.5.5 After successful insulation resistance to ground has been achieved, the winding shall be given a high potential or surge comparison test if required. Voltage level used shall be as indicated in EASA Recommended Practice for the Repair of Rotating Electrical Apparatus or other standards approved by purchaser.

10.5.6 The components, except the stator windings, shall be cleaned with hot water and a suitable detergent after heavy deposits of dirt and grease have been removed by scraping and wiping.

10.5.7 If necessary, brushes shall be used to clean small passages in components.

10.5.8 Solvents shall not be used to clean insulation, but may be used on mechanical components of the motor.

10.5.9 All components shall be thoroughly dried at a temperature less than 90°C (195°F), for as long as it takes to remove all signs of moisture. For windings, this will be indicated by the insulation resistance stabilizing after some hours of drying.

10.5.10 After satisfactory insulation resistance has been attained, all loose or Damaged wedges, slot sticks, coil supports etc., shall be replaced or repaired.

10.5.11 The winding shall then be given a dip-and-bake using a Class F or higher grade varnish.

10.5.12 Immersion and baking times shall be sufficient to penetrate any cracks and give a sealed durable finish to the insulation. The repairer shall notify the purchaser if a dip-and-bake is undesirable.

10.5.13 The routine overhaul of other parts of the motor shall return the parts to good condition.

10.6.0 OVERHAULING OF ROTOR

10.6.1 All rotors shall be given a test for damaged bars, whether the motor is suspect in this area or not. This test shall apply a stable single-phase voltage to the stator of the assembled motor while the shaft is slowly turned through at least one revolution. Any fluctuations of stator current in excess of 3 percent shall be investigated further.

10.6.2 Other methods may be used if the stator winding is faulty and it can be shown that they have a good record of detecting faults.

10.6.3 For motors where electrical or mechanical problems with the rotor are suspected, more sophisticated tests shall be used if required. These include one or more of the following:

- Growler tests;
- Current analysis or vibration analysis of a loaded motor;
- Physical examination;
- Ultrasonic examination of the bars and end rings; and,
- Core loss tests (axial current thorough shaft).

10.6.4 Since repair of squirrel cages can be expensive, no work shall be done in this area without purchaser approval.

10.6.5 For cage replacement, the conductive, metallurgical and strength characteristics of both the bar and end ring materials shall be determined and duplicated. Since changing the rotor resistance or density has major effects on the motor performance, no change in these is permitted without purchaser approval.

10.6.6 Any parts that are to be reused shall be cleaned and examined for defects.

10.6.7 After fabrication, the joints shall be examined and tested by ultrasonic or comparable means if required.

10.6.8 The rotor shall be dynamically balanced to the tolerances as per specifications.

10.6.9 A defective cast cage shall not be repaired without prior authorization from the purchaser.

10.6.10 The method of repair shall be to remove the old cage by chemical means, without damaging the laminations, followed by rebarring with extruded, aluminum bars and duplicate cast aluminum end rings to give the same cage resistance as before.

10.6.11 If tests or observation indicate that the laminations have been damaged, they shall be repaired or replaced with new laminations. Care shall be taken to ensure a consistent air gap. Because of the costs involved, this work shall not be done without prior purchaser approval.

10.6.12 If any tests indicate that there may be a shaft problem, it shall be tested and repaired or replaced. If there is any risk or uncertainty in the proposed repair method, this shall be discussed with the purchaser prior to proceeding.

10.6.13 When the work is completed, the shaft shall meet the following criteria:

It shall be straight, with a Total Indicated Run out (TIR) when measured in V blocks, of no more than 0.051 mm (0.002 inch) for up to 41.3 mm (1.625 inch) shaft diaMetre and not more than 0.003 inch for larger diaMetre s.

10.6.14 The shaft shall have no cracks. If ultrasonic, magnetic particle, dye penetrate or other testing methods are needed to verify this, they shall be documented in repair records.

10.6.15 The shaft shall be straight, parallel and undamaged at the bearing areas. If required it may be measured and if any measurable but acceptable Deviation from this is noted.

10.6.16 Journal may be repairs by welding or plating, followed by machining and grinding, with fit if required.

10.6.17 The shaft shall be a tight fit to the rotor iron. If there is looseness, the shaft shall be built up and turned for proper interference fit, or shall be replaced.

10.6.18 New shafts shall be machined from AISI Gr. C1045 hot rolled steel or better. For special applications, the service center shall consult with the manufacturer and report recommendations to purchaser.

10.6.19 Shaft extension dimension tolerances shall be within the limits specified in NEMA MG-1, Motors and Generators sections.

10.7.0 ANTI-FRICTION BEARINGS

10.7.1 Anti-friction bearings shall always be replaced. New bearings shall be the same type as originally used, unless otherwise approved by the purchaser.

10.7.2 If the bearing type, size, sealing, shielding or configuration is changed, this shall be noted on a supplemental nameplate.

10.7.3 If the original bearing race showed pitting from shaft current, the causes and remedy for this shall be discussed with purchaser.

10.7.4 If the method of shielding, sealing or lubricating is to be changed, it shall be approved by the purchaser.

10.7.5 Unless otherwise specified by the manufacturer or purchaser, C3 clearance bearings shall be used for all bearings.

10.7.6 Fitting tolerances to the journals and housings shall be per manufacturer's specifications. Out of tolerance fits shall be restored. (Reference ANSI/ABMA Std. 7-1995 as a guide.)

10.7.7 The bearing shall be heated, without use of direct flame, to approximately 94°C (200°F) to permit it to be slid easily onto the shaft up to the shoulder.

10.7.8 Bearings with bores under 45mm may be press fit.

10.7.9 Greasable bearings shall be lubricated as specified in the EASA Recommended Practice for the repair of Rotating Electrical Apparatus or other standards approved by the purchaser.

10.7.10 Lubrication shall be in accordance with the motor manufacturer's recommendations if available. Otherwise fill the cavity to 1/3 capacity. The lubricant shall be compatible with both the customer's lubricant and the lubricant packed by the bearing manufacturer.

10.7.11 Insulated bearing resistance shall be at least 10 megohms. Voltage applied from the megger should not exceed 500 VDC. Alternately a 115VAC test lamp may be used. No light should be visible from the lamp filament.(Reference IEEE 112-1996, section 9.4.3. or EASA AR100-1998)

10.8.0 END BRACKETS

10.8.1 End brackets shall fit properly to the stator frame. Worn dowel holes and defective fits shall be repaired.

10.8.2 Repairs to end bracket bearing housings if required shall be by building up the metal and machining to size. Welding, plating and sleeving are the accepted methods.

10.8.3 Epoxies and other compounds shall not be used for locking bearings.

10.9.0 FANS

10.9.1 Fans shall be checked for cracks and fit to the shaft or rotor.

10.9.2 Fans shall be firmly fixed to the shaft or rotor by the original factory method, unless there has been corrosion between dissimilar metals, in which case a new method shall be proposed to the purchaser.

10.9.3 Welding to the shaft is not permitted.

10.9.4 Repairs to fans shall only be done after discussion with Engineer in charge at site.

10.9.5 New fans shall be as supplied by the original manufacturer if available.

10.9.6 Fans used in motors for use in hazardous locations shall be made of material that will not cause sparking, either by impact or by buildup of static electricity.

10.6.0 TEMPERATURE SENSORS

10.6.1 Temperature sensors shall be installed in the motor as originally found or as otherwise specified by the purchaser.

10.6.2 Bearing temperature sensors shall be of the same type as those removed and shall be located to sense, as nearly as possible, the highest bearing temperature. If the original bearing sensor was insulated, the replacement shall also be insulated

10.6.3 Winding temperature sensor type shall be the same as the original and will usually be located in the end turns.

10.11.0 LEADS

10.11.1 Leads shall be flexible and multi stranded, and have at least the same cross sectional area as the original leads. Temperature class must be the same as original or better.

10.11.2 Main power and accessory leads shall be indelibly marked using the same marking systems as the incoming motor. If this is illegible, then the system described in NEMA MG-1, Motors and Generators, Section 2 shall be used and a notice describing the system attached to the terminal box.

10.11.3 Every effort shall be made to keep the original direction of rotation.

10.11.4 Lugs, if used, shall be suited for the application and have all cable strands in the l ug. No cable strands may be cut off or bent back to facilitate insertion in the lug.

10.11.5 If crimp lugs are used, the correct make and style of die shall be used for the particular lug, and the correct compression applied.

10.12.0 TERMINAL BOXES

10.12.1 Terminal boxes shall be returned to original condition. In particular, the following items must be confirmed.

10.12.2 Missing bolts and gaskets for both the cover and the motor-to-box joint shall be replaced.

10.12.3 On motors certified for hazardous environments, the junction boxes shall be sealed off from the main body of the motor by a sealing compound approved one as per standard.

10.12.4 Damaged flanges shall be repaired. No paint or gaskets shall be left on the flanges of boxes for explosion-proof motors.

10.13.0 SPACE HEATERS

10.13.1 Space heaters shall be tested for insulation resistance for one minute at 500 volts. A 10 megohm minimum resistance is acceptable.

10.13.2 They shall be tested for correct functioning.

10.13.3 Vibration sensors if any shall be replaced in their original locations.

10.14.0 BALANCING

10.14.1 The motor rotor shall be dynamically balanced in a balance stand before assembly of the motor. Balance criteria include the following:

10.14.2 The rotor shall be balanced with a half key in the keyway.

10.14.3 Balancing Tolerance G2.5 (ISO 1940-1).Generally, the permitted total imbalance is 15W/N/2 =oz in/plane where W is weight of rotor in pounds and N is operating speed in RPM. (426 W/N/2 gm. in/plane)

10.14.4 Balancing tolerance G1.0 (ISO 1940-1). Two Pole rotors should be balanced to 6W/n/2 = oz.in./plane (170.4 W/n/2 gm. in/plane)

10.14.5 If material is removed, structural integrity and fan capacity shall be maintained.

10.14.6 Added material shall be able to withstand the centrifugal forces and be positioned either in the manufacturer's designated positions and locked in place, or positioned in a location where centrifugal force will tend to keep the material in place.

10.14.7 Weights may be attached to metallic parts only.

10.15.0 REASSEMBLY

10.15.1 The assembly of the motor is the reverse of the disassembly process and the following points shall be observed:

i. Match marks shall line up.
ii. On reinsertion of the rotor, take care not to damage the journals or the stator windings.
iii. Cranes, slings and extension pipes shall be used on heavy rotors.
iv. Check axial alignment of stator and rotor cores.
v. Dowels and fitted bolts shall go back into the same holes that they came from.
vi. Where they can be measured, all air gaps shall be within 10 percent of the average.
vii. On motors with insulated bearings, the insulation shall be checked and noted.
viii. On vertical motors, the lift on the shaft shall be the same as the original manufacturer's setting, unless purchaser and the repairer agree that a modified setting would give better performance.
ix. Motors for use in hazardous environments shall have all the explosion- proof features maintained and verified in accord with UL674.

10.16.0 TESTING

10.16.1 Prior to running, the motor shall be given an insulation resistance test using2500 volts DC megger.

10.16.2 Readings corrected to 40°C, which are less than 20 mega ohms, shall be discussed with purchaser.

10.16.3 After the insulation tests, the motor shall be run at no load at full terminal voltage, with either a half key or a half coupling, on the shaft.

10.16.4 If the motor uses an external oil supply and removal system in normal use, a similar system shall be arranged for the test.

10.16.5 No load current unbalance at balanced rated voltage shall be measured and verify that is within permissible limit.

10.16.6 Horizontal, vertical and axial vibration readings shall be taken at each bearing and results recorded for Site in charge's review. Tolerance shall not exceed EASA Recommended Practices, Table 4-5, or other standard provided by purchaser.

10.16.7 Temperature rise after levels stabilize shall be within normal limits on the frame and bearings.

10.17.0 ERECTION

10.17.1 After completion of no load test the motor shall be erected on the frame.

10.17.2 The alignment between the motor and the load (ie gear box) shall becarried out to the relevant standard specification.

10.17.3 The terminal cables and earth connections are restored as before dismantling.

10.18.0 COMMISSIONING

10.18.1 After completion of erection, the motor shall be tested for insulation resistance using 2500 volts DC megger.

106.18.2 After completion of IR value test, the operation of the motor at rated load shall be checked by starting the motor at rated working condition.

10.18.3 The major test paraMetre s like full load current, temperature rise, vibration, notice etc., shall be measured and recorded.

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10.19.0 PAINTING

10.19.1 Before putting into service, all motors shall have all parts coated with anti-rusting compound.

10.19.2 All motors shall be painted with an approve manner using two primer coats, one undercoat and one finish coat to the Painting Specification and as per the instruction of the Engineer at site.

10.19.3 All surfaces of the motor thoroughly cleaned and degreased prior to painting.

10.19.4 Any lubricant and coolant inlets and outlets shall be plugged and masked before painting

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CHAPTER- XI

REPLACEMENT OF GATE HOIST MOTOR

TABLE OF CONTENTS

11.1.0 SCOPE

11.1.1 The scope of this section comprises of supply, store at site, erection, testing and commissioning of new three phase induction motors in the gate hoist system etc.

11.1.2 The work under this specification shall consist of furnishing of all materials, tools &plants, labour, transportation and everything necessary for carrying out the work.

11.1.3 The works shall be executed generally as per the specification and as directed bythe Engineer at site.

11.1.4 For details not covered in these Specifications, relevant IS code shall bereferred to. All references to BIS-Specifications and codes are for codes with amendments issued up to date i.e. till the date of call of tender.

11.2.0 APPLICABLE CODES AND SPECIFICATIONS

11.2.1 Motors shall be manufactured in accordance with the latest Indian Standard Specification current at the time of order, including amendments

IS 325 : Three phase induction motors
IS 1231 : Dimensions of three phase foot mounted induction motors
IS 1271 : Thermal evaluation and classification of electrical insulation
IS 2148 : Flameproof enclosures for electrical apparatus
IS 2223 : Dimensions of Flange mounted A.C. induction motors
IS 2253 : Designation for Types of construction and mounting arrangements of rotating electrical machines
IS 2254 : Dimensions of vertical shaft motors for pumps
IS 2968 : Slide rails for electric motors, dimensions.
IS 4029 : Guide for testing 3 phase Induction Motors
IS 4691 : Degree of protection provided by enclosures for rotating electrical machinery
IS 4722 : Rotating electrical machines
IS 4728 : Terminal marking and direction of rotation for rotating Electrical machinery.
IS 4889 : Method of determination of efficiency of rotating electrical machines
IS 6362 : Methods of cooling for rotating electrical machines
IS 7816 : Guide for testing insulation resistance of rotating machines.
IS 8789 : Values of performance characteristics for 3 phase Induction motors
IS 12065 : Permissible limits of noise level for rotating electrical machines
IS 12075 : Mechanical vibration of rotating electrical machines with shaft heights 56mm and higher-Measurement, evaluation and limits of vibration severity
IS 12802 : Temperature rise measurement of rotating electrical machines.
IS 13529 : Guide on effects of unbalanced voltages on the performance of three phase cage induction motors.
IS 13555 : Guide for selection and application of three phase induction motors for different types of driven equipment.

11.3.0 CLIMATIC CONDITIONS

11.3.1 Climatic conditions and other environmental conditions will be taken into consideration as the motors are put into service in dam sites.

11.3.2 It should be noted that the motors shall be suitable for use in tropical climate with high humidity, heavy rainfall, and conducive to fungus growth and corrosion.

13.1.0 ELECTRICAL SUPPLY SYSTEM

13.1.1 Variations in electric supply, under which motor shall be operated continuously without any adverse effects, will be considered.

13.1.2 Motor Rated Voltage is 415 Volts, Variation + 10%

13.1.3 Frequency 50 Hz, Variation + 5%

13.1.4 The capacity, speed and other paraMetre s shall be as per the specification and supplied only after the approval of the Engineer at site.

11.5.0 DESIGN FEATURES

11.5.1 All motors shall be continuous maximum rated unless otherwise specified in Data Sheet. Intermittent rated motors shall conform to duty cycle specified in Data Sheet.

11.5.2 Motor body or frame shall be of close grained cast iron or of welded steel construction in case of large motors. The design of the body shall ensure ruggedness and damping of vibration. The rotor along with the fan and half coupling or other drive device (if fitted) shall be statically and dynamically balanced.

11.5.3 All parts of identical motors, such as rotors, bearings and end shields, etc. shall be fully interchangeable with specific reference to rotor.

11.5.4 Design and construction of the motors shall be such as to facilitate inspection, cleaning, maintenance and repairs.

11.5.5 Fans provided for fan-cooled motors shall preferably be of the non-directional type, with protection against accidental contact. In case they are uni-directional, direction of rotation shall be clearly indicated on the non-driving end of the motor.

11.5.6 All motors shall have single or double bare shaft extension with key way and key, as per the specification.

11.5.7 Fans for motors used in hazardous areas (Zone 1 and 2) shall be manufactured from non-sparking material and if non-metallic shall be painted with an electrically conducting paint, to prevent accumulation of static charge.

11.5.8 Direction of airflow, in case of slip ring motors, shall be such that airflow will carry the carbon dust away from the winding.

11.5.9 Air to water heat exchanger shall have double tube plates; spray baffles and driptrays with siphon drains to prevent water reaching the windings.

11.5.10 Type of mounting required shall be as per specification.

11.5.11 The slip ring motor shall be suitable for slow speed in continuous mode with rotor resistance connected.

11.5.12 The slip ring motor shall be suitable for operation with liquid resistance or salt immersed or cast iron starters as specified in particular specification/data sheet.

ENCLOSURE

11.5.13 Enclosures for motors shall be as specified in Data Sheets. Degree of protection in accordance with IS-4691 shall also be as per Data Sheet.

11.5.14 Motors for outdoor installation shall be of weatherproof construction (IPW 55) such that no additional protection is required to be provided by the Purchaser.

11.5.15 Construction of enclosures for flameproof (Exd) motor and the terminal box shall conform to IS .

11.5.16 Construction of enclosures for increased safety (Exe) motors shall conform to the latest Indian Standard Specification 6381 and shall be suitable for temperature class specified.

BEARING & LUBRICATIONS

11.5.17 All motors shall have ball and/or roller bearings or bearings of the sleeve type. Vertical motors shall have special thrust bearings.

11.5.18 All bearings shall be of reputed manufacture and of a type interchangeable with other makes and types. Ball and roller bearings shall have an L10 life of40,000 hours.

11.5.19 All bearings shall be provided with seals to prevent the ingress of dust, moisture and all other harmful substances.

11.5.20 For large capacity motors, the bearing shall be of the pedestal oil ring lubricated, sleeve type, fitted with liberally sized oil reservoir and level indicator. Sleeve bearings shall be designed with low bearing pressures and provided with drain plug. A thermoMetre with alarm and trip contacts shall also be provided. Lubrication of motor bearings shall be as per manufacturer's standard practice/design.

11.5.21 Grease lubricated bearings shall be packed with suitable grease before the motors are dispatched. These shall be provided with nipples, and relief valves or plugs, suitable for on-line greasing.

11.5.22 Wherever necessary, insulating pads between the bearing pedestals and bed plate shall be provided to eliminate shaft circulating currents. An earth terminal shall be provided on the drive end bearing pedestal.

11.5.23 For unlocked shafts, the end clearance on the motor shall exceed the coupling end float. Permissible limits of rotor movement shall be marked on the shaft.

11.5.23 The as built motor data sheets which shall be submitted by the supplier shall contain bearing number for easy reference.

TERMINAL BOX

11.5.24 Terminal boxes shall be cast iron or of welded steel construction with screwed conduit entries.

11.5.25 The size of the terminal boxes, conduit entries and terminals shall be suitable for termination and connection of specified type and size of cables.

11.5.23 Adequate space shall be provided for termination of aluminum conductor cables.

11.5.27 The terminals shall be complete with two flat washers, one lock washer and nut to make them secure and vibration-proof.

11.5.28 Numbers of terminals shall be as given below :

SCR Motors upto & including 7.5 KW - 3 Nos.

SCR Motors above 7.5 KW - 6 Nos.

Slip ring motors - 6 Nos.

11.5.29 In case of slip ring motors, separate terminal boxes should be preferably provided for stator and rotor connections.

11.5.30 Terminal boxes for power cables shall be located on right hand side when viewed from the driving end or on top. The terminal boxes shall be rotatable in steps of 90° without disturbing the motor winding connections to the terminal block.

11.5.31 Caution nameplates on flameproof or increased safety motor terminal boxes shall be as per IS 2148 or IS 6381 respectively.

11.6.0 STARTING CHARACTERISTICS

11.6.1 Unless otherwise specified, motors shall be designed for direct-on-line starting.

11.6.2 All motors shall be suitable for starting under specified load conditions with80%of the rated voltage at the terminals.

11.6.3 Minimum locked rotor thermal withstand time at rated voltage shall be 10 seconds under cold condition and 8 seconds under hot condition, unless otherwise specified.

11.6.4 Unless otherwise agreed, the starting time of the motor shall be less than the hot thermal withstand time of the motor.

11.6.5 Motors shall be designed for re-acceleration under full load after a momentary loss of voltage with the residual voltage being 100% out of phase.

11.6.6 Motors shall be designed to allow the minimum number of consecutive starts indicated below

No. of consecutive start-ups with initial temp. of the motor at ambient level (cold) : 3

No. of consecutive start-ups with initial temp. of the motor at full load operating level (hot) : 2

11.6.7 Starting current of squirrel cage motor with full voltage starting shall normally not exceed 600% of the full load current with tolerance specified in IS 325.

11.6.8 Starting current at full voltage of slip ring shall be limited by the rotor resistance starter to the values indicated in the Data Sheets. However, the value of locked rotor current shall not exceed that stated in 22.6.7 above.

11.6.9 Motor manufacturer shall furnish appropriate value of external resistance required to limit the starting current as well as to obtain the required starting torque.

11.6.10 Starting torque of Squirrel cage induction motors started on full voltage shall generally not be less than 200% of the full load torque. Cases, where higher starting torque is required, will be indicated in Data Sheets. Pull out torque (breakdown) of motors shall not be less than 200% of the full load torque.

11.6.11 In case of H.V Motors and L.V. Motors driving high inertia equipment, the manufacturer shall provide calculations for acceleration time, torque speed curves for motor and current time curves. Necessary Data for the driven equipment such as torque-speed curves, moment of inertia etc., shall be furnished by others for this purpose.

11.6.12 In case of reciprocating compressor or similar equipment, the stator current pulsations shall be given by the manufacturer. In all cases, manufacturer shall ensure that the starting current withstand time of the motors shall be higher than the calculated starting time.

11.7.0 INSULATION AND WINDINGS

11.7.1 Winding of motors shall be treated or impregnated with suitable varnishes to render them non-hygroscopic and resistant to dirt and oil. Windings shall also be treated to make them resistant to acidic / alkaline vapours when the atmosphere is specified as corrosive.

11.7.2 In case of SPDP motors, used for outdoor installation, or in case of vertical hollow shaft pump motors, end turns of windings shall be treated with epoxy based varnishes for weather resistance. Suitable baffle shall be provided to avoid direct splashing of water on the windings.

11.7.3 H.V. and LV Motors shall have class 'F' insulation with class 'B' temperature rise.

11.7.4 Insulation of H.V. motors should withstand high surges due to switching operations of vacuum / SF6 / Min oil circuit breakers.

11.7.5 All insulating materials used in the construction of motors shall be non-hygroscopic.

11.7.6 Coils shall be made of good quality copper wire.

11.7.7 Insulation and impregnation of windings shall be carried out in a manner, which will facilitate easy removal and replacement of coils.

11.7.8 All coils shall be adequately supported to prevent movement under shock or short circuit stresses, or shocks due to electrodynamics braking with phase reversal.

11.7.9 Joints shall be kept to a minimum, where joints are made, conductors shall be tinned to prevent oxidation, riveted and soldered or brazed.

11.7.10 All joints shall be supported adequately to relieve them from mechanical strain. Insulation level of the joints shall not be less than for the motor windings.

11.7.11 Leads from motor windings to the terminal box shall be adequately supported throughout and shall be kept away from sharp edges to prevent abrasion.

11.7.12 Openings in the motor frame through which the leads are brought out shall be sealed to isolate the terminal box from the motor.

11.8.0 TEMPERATURE RISE

11.8.1 The temperature rise of motors for all types of enclosures when tested in accordance with IS 325 shall not exceed the limits specified therein, corresponding to the class of insulation used and on the basis of normal conditions of service.

11.9.0 ROTORS

11.9.1 All rotors shall be free from excessive inherent axial thrust.

11.9.2 End play of rotor shall be kept to a minimum, unless Data Sheets specify the end-float required.

11.6.0 SLIP-RINGS & BRUSH GEAR

11.6.1 Insulation of slip rings shall be of the same class as that of motor.

11.6.2 Slip rings and brushes shall be easily accessible for inspection and maintenance and shall be designed to require minimum maintenance. (It should not be necessary to inspect, clean or maintain slip rings and brushes more than once a year).

11.6.3 Slip rings shall have ample clearance to prevent flashover and sparking during starting as well as operation.

11.6.4 Brush-lifting and short-circuiting gear shall be provided for large motors, where surface speeds of slip rings will be fairly high, resulting in excessive wear on the brushes. When brush lifting short circulating gear is provided, an interlock to prevent starting of motor with the brushes lifted shall also be provided.

11.11.0 EMBEDDED TEMPERATURE DETECTORS

11.11.1 Embedded temperature detecting sensors may be provided when specifically asked for.

11.11.2 Adequate precaution shall be taken to ensure that detector leads shall not be charged accidentally to motor potential. Film type arrestors will be fitted at detector terminals in terminal boxes to prevent danger to detecting equipment and personnel.

11.12.0 ANTI-CONDENSATION

11.12.1 Anti-condensation heaters shall be provided when specifically asked for.

11.12.2 Heaters shall normally be suitable for 250 volts, Single Phase, A.C. supply, designed for continuous operation unless otherwise specified in Data Sheet.

11.12.3 Heaters shall be metal encased with a low surface temperature. In addition, a removable, threaded, plug shall be provided to remove condensed moisture.

11.13.0 LIFTING HOOK

11.13.1 All motors shall be provided with lifting hooks or eye bolts.

11.13.2 Two earthing terminals comprising terminal studs, two plain washers, one spring washer shall be provided preferably on diagonally opposite sides of the frame.

11.13.3 All accessories used shall be hot dip galvanized.

11.14.0 PAINTING

11.14.1 All motors and its parts shall have coated with anti-rusting compound.

11.14.2 All motors shall be painted in an approve manner using two primer coats, one undercoat and one finish coat to the Purchaser's Painting Specification, and shall have all surface thoroughly cleaned and degreased prior to painting.

11.15.0 RATING PLATES, LABELS & MARKING

11.15.1 Rating plates shall be provided on all motors. These rating plates together with any labels giving necessary instructions shall be of a design so that corrosion will not cause obliteration. As a minimum all the necessary information as per relevant standards shall be furnished on the nameplate.

11.15.2 The Purchaser's Motor reference and bearing numbers and other details shall be marked on an auxiliary stainless steel nameplate if called for in Data Sheets.

11.16.0 VIBRATION AND NOISE

11.16.1 Limits of vibrations shall be in accordance with IS-12075.

11.16.2 The mean sound pressure level of motors shall not exceed 85 dB at 1 Metre , measured in accordance with IS-12065 or relevant IEC standard.

11.16.3 When slide rails, bedplates or soleplates are supplied along with motor, the holding down bolts for the motor shall also be supplied. All embedded parts shall be supplied and shims of SS 304 shall be used.

11.17.0 COOLING SYSTEM

11.17.1 All LV motors shall be self ventilated, fan cooled.

11.17.2 Fans shall be corrosion resistant or appropriately protected. They shall be suitable for motor rotation in either direction without affecting the performance of the motor. If this is not possible for large outputs, it shall be possible to reverse the fan without affecting the balancing of the motor.

11.18.0 SPECIAL TOOLS

11.18.1 A set of any special tools necessary for maintaining the whole of the requirement supplied shall be provided.

11.19.0 INSPECTION AND TESTING

11.19.1 Test Certificates shall be furnished for all motors as per specification.

11.19.2 Routine tests as per IS 4722 / IS 4029 / IS 325 shall be carried out on all motors.

11.19.3 Type tests shall be carried out on L.V. Motors, when specifically called for. In case of identical motors, type tests may be carried out on the first of each rating and speed.

11.19.4 The Purchaser reserves the right to witness all tests and the Purchaser shall be given ten working days notice of all tests being carried out.

11.19.5 All apparatus, instruments etc. required for tests shall be provided by the manufacture and shall have been checked and tested for accuracy during the twelve months prior to the test.

11.20.0 DRAWINGS AND DATA

11.20.1 The drawings shall generally include the following:

GA drawings	Fully dimensioned, indicating foundation details, number and size of cable entries, frame sizes etc.
Terminal Box Drawing	Fully dimensioned, including arrangement of terminals Terminal Wiring Diagram

11.21.0 SPARES

11.21.1 The Tender der shall provide with his quotation, separate priced list of recommended operation and maintenance spares. A set of bearings shall be supplied as Mandatory spares.

11.22.0 DEVIATIONS

11.22.1 Deviations from specification must be stated in writing at the Tender stage.

11.22.2 In the absence of such a statement, it will be assumed that the requirements of the specification are not without exception.

Special Conditions

MATERIALS SPECIFICATIONS

All the materials shall be of tested quality, new unused free from defects and of the grade / classification envisaged in the designs. The contractor shall furnish the test certificate for each lot of materials, if so required by the purchaser Plates with laminations discovered during, welding or during inspection shall be rejected Materials not supplied according to the approved designs / drawings shall be rejected, removed and replaced. Approval of purchaser shall not relieve the manufacturer from the responsibility of supply of suitable material. Recommended materials for some of the components are appended below.

Sl.No.	Component/part	Recommended Materials	Reference
1.	All structural members such as skin plate horizontal girders, vertical stiffeners, guides, hoist - connection brackets, dogging devices etc., and seal seat bases, sill beams etc.	Structural Steel	IS 226/2062 (For Plate thickness of more than 20 mm use only steel conforming to IS2062
2.	Wheels and Guide rollers	Cast steel or forged steel	IS 1030 and IS 1875
3.	Wheels, Pins, or axes lifting pins etc.	Corrosion resisting steel/ hard chrome plated, cast or forged steel.	IS 1570(Part V)
4.	Bushing	Bronze bushing with suitable, ubricating arrangement	IS 305
5.	Seal Seats, Sill plate	Stainless Steel	IS 1570 (PartV)
6.	Seals	Synthetic or natural rubber	IS 11855
7.	Seal bolts/ Screws	Stainless Steel	IS 1570 (Pt.5)
8.	Rope drum	Cast Iron Cast Steel Mild Steel	IS 210/ 1978 IS 1030 IS 226/2062
9	Steel Wire Rope	Galvanised / Steel Rope	IS 2266/ 1977
10	Wire Rope socket	Drop Forged Steel	IS 2004
11	Shaftings, pin etc.,	Forge Steel Structural Steel	IS 2001/1978 IS 2062- 2006 IS 2062 E -250 GR - B
12.	Electric Motors		IS 325/ 1075

Superintending Engineer, WRD.,
Vellar Basin Circle, Cuddalore -1

TENDERER

2. Materials

Steel Supplied by Contractor

Contractor shall furnish to the purchaser/ Engineer duplicate copies of all Mill orders covering the materials ordered by him for this project and also the test reports received from the mills for Purchaser's / Engineer's check and information.

It is not intention of the purchaser that all the steel materials to be supplied by contractor for the work shall be specially purchased from the rolling mills, Contractor's stock material may be used provided the mill test reports identified with the materials, satisfactorily demonstrate specified grade and quality. Also all such materials supplied by contractor shall be in sound condition, of recent manufacture, free from defects, loose mail scale slag intrusions, laminations, pitting, flaky rust etc, and be of full weight thickness specified.

Unidentified stock material may be used, only with prior permission from Engineer in writing, for short sections of minor importance or for small unimportant works and connections where in the opinion of Engineer, the quality of such materials would not adversely affect the strength and / or durability of the structure. Engineer may also permit use of such material for other works if adequate random samples taken out and tested to demonstrate conformity with specification and requirement for the work in view.

All steel materials such as steel plates, structural members, handrails, bolts nuts, screws and all consumables etc., required for fabrication, supply erection and satisfactory commissioning of the barrage gates and its associated equipments structures as per specification are to be procured by the contractor at his cost and the quoted rates shall be inclusive of all materials. The suppliers shall furnish test certificates issued by the manufacturers for the steel materials while supplying the relevant component item of work contemplated under the contract.

The tenderer shall furnish clearly in their tender the type of steel plates and structural, they proposed to use for the skin plate of the gate and other members. The tenderer shall also furnish the approximate weight of each component, namely, embedded parts gates, deck bridges, hoist to prima-facie check if the design of the gates is alright.

3. EMBEDDED PARTS

Masonry / concrete adjoining the gates. Necessary grooves for the gates will be left in the masonry / concrete to the dimensions and details to be furnished by the supplier well in advance to received the sill beam, roller path and guide roller arrangements and other embedded pats. Complete working drawings for leaving / providing blackouts in the masonry concrete for the guides, sills etc. shall be submitted by the Contractors within one month and the parts for the embedment shall be delivered by the contractors as indicated by them in the progress chart.

4. DOGGING BEAMS

Dogging beams shall be supplied for supporting the gates in raised position. They will be located near the M.W.L. or at top of pier. particulars and size of recess requires are to be furnished by the gate supplier.

The dogging arrangement shall be strong enough to safely sustain the loads. They should be in such sections as can be easily handled by men for placing in position and removing and should be permanently chained to the frame to prevent loss of any section falling down to the gates slot. Detailed drawings of the dogging beam arrangements shall be submitted by the successful tenderer sufficiently early to enable the department to provide for suitable recesses in the hoist supporting piers if necessary.

5 GATE WITH ROLLER WHEELS, SEALS, ETC.,

(a) The regulator gates shall be of vertical lift type with fixed wheels. the gates should be electrically operated with provision for manual operation. The gates will be normally kept in closed position over the sill and will be lifted up when the water level is likely to rise above MWL or for regulation at any level of water. Particular attention should be paid for water tightness which is an important consideration.

The gates are to be manufactured to suit the clear openings of vent. The actual dimensions of the gates may be decided by the suppliers providing due allowances for the guides, grooves, water seal etc. Necessary drain holes in all members where water may collect and large hole in beam webs etc., for aeration of the water jet under the gate shall be provided.

6. Gate Wheels

Suitable device of lubricating the wheels on sides and the wire rope pulley fixed to the top of the gate should be provided. Rollers will be of adequate diaMetre and will be so spaced and fixed that they evenly bear on the roller surface and carry loads equally in the closed position of the gate.

7. Guide Roller

The gates shall be fitted with spring loaded guide wheels or other suitable device which is more efficient in function of the sides on the gates to ensure that the gates enters the opening truly paralled to the side tracks. Spring loaded guides rollers preferred to guide shoes and the tenderer shall adopt the latest practice.

8. Seals

Gate seals for water tightness are to be provided for sides and bottom of each gate. The seals are to be provided on the upstream side of the gate. Under all static heads and especially under low water levels, the seals in the sides of the gate should be perfectly water tight. The seal at the bottom of the gate which will be pressing against the top surface of sill beam due to the self weight of gate should be perfectly water tight especially under high water level conditions.

Stainless steel linings should be provided for the seating of the seals at sides and bottom.

9. DECK BRIDGE

The deck bridge shall be of sufficient width to carry the weight of hoist with all its accessories, weight of gate etc., Suitable walkway, ladder and platform arrangements, handrails for operations maintenance works should be provided.

6. HAND RAILS

Hand rails shall be provided on open sides of platforms stairways and around all openings. Hand rails shall be of standard weight galvanized steel pipe of flush welded construction, ground smooth using required nominal bore light class pipe posts spaced not more than two Metre s apart. Angle hand rail posts may be provided if specifically called for.

Smooth uniform curves, and bends shall be provided where so ever required. Open ends of all the pipe posts shall be plugged and welded. A minimum radius of 3 times the pipe diaMetre shall be provided at all points of direction changes in the hand rails.

11. CHEQUERED PLATE

Composite Chequered plate used shall be 6mm thick or as indicated and shall be capable of carrying a minimum live load of 400 kg /sq. Metre unless otherwise specified on design drawings. Chequered plate shall be fixed by 8 mm. Screws with counter sunk heads at required spacing. The members supporting the chequered plate shall be spaced in such a way to carry the live load. The composite material has high strength to weight ratio, durable, height weight and ease in handling. The composite chequered plate has very good anti slippery property UV resistant and corrosion resistant property.

12. HOISTING ARRANGEMENTS

The hoisting equipments such as reduction gears, motors rope drums etc., shall be on the top of the operation platform. Chain hoist instead of rope hoist will not be accepted. Factor of safety provided for the steel wire rope should be stated and test certificate for the same shall be produced. In any case the factor of safety should not be less than 6.5. The maximum pull likely to come on the wire rope under worst kind of operation to be in conformity with LS 6938. The hoisting equipment shall be provided with suitable weather proof metal cover. The hoisting equipment shall be complete with all electrical and mechanical fittings and shall include the following.

(a) Electric motors of suitable capacity under the conditions mentioned in this specification with switches for various operations.

(b) Contact Gear

(c) Solenoid brake

(d) Push buttons, control panel board with provision for raise, lower and stop

(e) Interlocking arrangements for automatic cutting off of the electric supply when the hand crank is engaged for hand operation and the vice versa.

(f) The equipment shall be suitable for use at 400/440 Volts 3 Phase 50 cycles A.C Energy will be available at 230 volts A.C. between phase and ground for single phase connection if required.

(g) Each hoist will be controlled by push buttons to raise, lower or stop the gate with motor energized. The limit swatches will stop the gate in the closed position and will prevent the wire rope drum from unwinding the last two coils from the drum or from over winding on the drum in case of gates in fully opened position.

(1) Stop the gate during raising in the maximum lift position above the top of barrage and at the appropriate moment to prevent over run in the hoisting direction.

(2) To stop the gate at 100 mm above the sill level automatically and allow the gate to sink slowly by hand operation to the sill.

(h) The manual hand crank for hoisting the gates shall be provided.

(i) The rope drum and open gears shall be protected by metal cover.

(j) The gate should be capable of working as a "regulating gate" suitable for any head upto the maximum head.

(k) Main Switch gear of suitable capacity to be provided at the tower in abutment pier.,

(l) The electrical wiring for the main switch at the abutment piers to the individual starters/control panels over the hoist deck and connection from the starter/control panel to the motor, brake etc., should be laid by the contractor neatly, using suitable cable tray an fixing arrangements.

The connection to the main switch gear at the abutment pier from the nearby Electricity Board mains should also be made by the contractor by laying suitable cables with cable tray and arrangements taken underground suitably. The site may be inspected to get the full details.

13. Special Tools

Special tools such as special spanners, Sockets or wrenches hand crank necessary for repairs and maintenance shall be supplied.

14. TEST OF BUTT WELDS

Minimum requirement of radiographic testing of butt joints shall be as under

1.	Skin Plate	a.	10% Ultrasonic test more than 12mm thick plates
		b.	40% Dye penetrate magnetic particle test.
2.	Horizontal girder		100% Ultrasonic test
3.	Hoist support structure		100% Ultrasonic test.

15. MANUFACTURE

All the works shall be performed and completed in a thorough workman like manner as per the best modern practice in the manufacture and fabrication of materials of the types covered by these specifications. The work shall in all cases be of high grade and carefully performed to the satisfaction of the authorized representative of the purchaser. The tenderer shall warrant all materials and workmanship furnished by him to be free from injurious and defective materials or defective workmanship and shall bear all cost of the repair in case of any error for which he is responsible. Workmanship shall confirm to the relevant standards laid down by the Bureau of Indian Standards. All sharp corners which can damage the matching parts shall be rounded and chamfered.

16. TOLERANCES

Where tolerances or fits are not specified on the drawings the tenderer shall follow the best modern shop practice fir apparatus of the type covered by these specifications and drawings with due considerations being given to the special nature of function of the parts and to the corresponding accuracy required to secure proper operation.

17. MACHINE FINISH

Where finished surfaces are not specified on the drawing, the type of finish shall be that most suitable for the part to which it applies and shall be as per IS 3073 (latest edition) A smooth finish (Two delta i.e., 16 tp 6.3 microns) will be required for all surfaces in sliding or rolling contact and for surfaces in permanent contact where a tight joint is required. A finish (Single delta i.e. 6.3 microns) shall be given to all other machined surfaces where selective assembly for matching parts is specified on the drawings or other wise required. The parts shall be ground, if necessary to obtain the limiting tolerances.

18. CASTINGS

While making patterns for the castings, care shall be taken to avoid sharp corners or abrupt changes in cross section and ample filets shall be used. All castings shall be true to patterns and the thickness of the metal shall not vary at any point by \more than 5mm from that shown in the drawings. Care shall be taken in the foundry to cool the castings properly so that they will not warp or twist. No castings will be accepted of it is warped or twisted to such an extent that machined surfaces cannot be properly finished to the dimensions shown on the drawings.

All castings shall be sound, clean free from cracks, holes or sand holes and other defects. These shall have a workman like finish Castings shall not be repaired, plugged or welded without the permission of the purchaser. Such permission shall be given only when the defects are small and do not affect the strength, use or mach inability of the castings. No welding shall be done after the castings are finally annealed. No defect shall be removed and paint or oil be applied to the surface of any casting until it has been inspected by the purchaser or his authorized representative. The treatment for casting involves heating slowly upto a temperature of about 40 degree C above its upper critical temperature holding it at the temperature just only long enough for a uniform temperature to be attained throughout the casting and then allowing it to cool slowly in furnace. During the process the requisite

annealing temperature shall not exceed and over heating shall be avoided. End products shall conform to the requirements of relevant Indian Standard. All castings shall be ultrasonically tested to ascertain soundness of castings. Acceptance criteria as specified by the purchaser shall be binding.

19. Forgings

All forgings shall be done in accordance with the latest practice and shall exhibit physical and chemical properties envisaged in the corresponding Indian Standards. Only those forgings shall be used whose working is well known without doubt.

20. Fabrication of Structural Steel

The contractors are supposed to perform fabrication in the best possible manner to meet the requirements of designs and drawings. However some specific guidelines are appended herein.

21. Straightening of Members

Before being laid off or worked in any manner, structural steel shall be straight without twists, bends or kinks and if straightening is necessary, if shall be done by a method which shall not injure the metal to ensure good welding and fittings of members. All steel shall be cleaned of dirt, mill scale and rust prior to fabrication.

22. SHEARING SHIPPING AND GAS CUTTING

Shearing, chipping and gas cutting shall be performed carefully and all portions of the work which are exposed to view shall, present a near appearance. Finishing of sheared or cut edges of plates or shapes will not be required except as noted in these specification.

23. EDGES TO BE WELDED

The edges of plates and shapes to be joined by welding shall be properly formed to suit the type of welding selected. Where plates and shapes have been sheared, edges joined by welding the weld shall be machined or chipped to sound metal. Plates and shapes to be field welded shall have their edges prepared in the shop for the type of weld selected.

24. BENT PLATES AND SHAPES

Where bending or forming of plates or shapes is required. The plates or shapes shall be bent by cold forming. Heating and hammering to correct bends will not be permitted.

25. WELDING

a. WELDING TECHNIQUE

Care shall be taken in designs that the welds when being made, are well accessible overhead welding is to be avoided, if possible and flat position is to be strived for.

Drawings should clearly indicate the joint position shop or field welding, kind of welding, method of welding sizes and other required points. Symbols to be shown on the drawing should conforma to relevant, Indian Standards.

All welding shall be done by the electric are method by a process which will exclude the atmosphere from the molten metal except where otherwise specifically permitted. All welding electrodes, required shall be furnished by the contractor. Correct selection of electrodes shall be done taking due care of welding method and base metals of components. The welding electrodes shall be of the heavily coated type designed for all position welding. the make type and size of all welding electrodes shall be subject to the approval of the purchaser.

In assembling and during welding the component, parts of built up members shall be held in place by sufficient clamps or other adequate means to keep all parts in proper position. The surface to be welded shall be cleared or Scale, slag, rust, paint and other foreign matter, except that thin coat of linseed oil need not be removed before welding. Where weld metal is deposited in two or more layers, each layer shall be brushed with a wire brush or otherwise cleaned before the subsequent layer is deposited. In welding, precautions shall be take to minimize stresses due to heat by using the proper sequence in welding. Upon completion the weld shall be brushed with wire brush and shall show uniform section smoothness of weld metal. Edges and ends of filets and but joint welds shall indicate good fusion and penetration into base metals. Specific requirements for butt joint land fillest joints are given below.

1. Butt Joints

In principle but joints should be made by the back run. Should it not be possible to de the back run either a backing strip should be places and welding should be so made that the melted metal fully penetrates the backing strip or the side butt welding should be executed so that the melted metal reaches the back of the groove and a full penetration is achieved. Dye penetration test shall be carried out after each pass of weld.

2. Fillet Joints

All fillet welds shall be continuous. For the main member, no fillet welding should be made on members whose thicknesses differ substantially. Fillet weld at 'I' Joints should be made, as a rule on each side of the joint, Unless it is agreed otherwise due to some practical reasons, they shall be tested ultrasonically or by Die- penetration test for soundness.

b. QUALIFICATION OF WELDING PROCESS

A specification of the welding process, that is proposed to be used shall be established and recorded and if required a copy of such specification together with a certified copy of report of results of tests made in accordance with the process and specifications shall be furnished. The qualification of the welding process shall be atleast equal to that required by " Standard qualification procedure" of the Indian Standards and the minimum requirement of the tests shall be at least as stated in the said " Standard Qualification Procedure"

c. QUALIFICATION OF WELDERS

The contractor shall be responsible for the quality of the work performed by his welding staff. All welders assigned to the work shall have passed qualification tests for welders. If at any time the work of any welder appears questionable, the welder shall be required to pass additional qualification tests to determine his ability to perform the type of work on which he is engaged.

26. Riveting

Rivets shall be driven by power riveters employing pneumatic, hydraulic or electric power After driving, their finished heads shall be for approximately hemispherical shape of uniform size throughout the work for the same size rivet, neatly finished and concentric with the holes. Rivets shall be finished and heated uniformly to a temperature not exceeding 1065 deg. C. They shall not be driven after their temperature has fallen below 528 deg. C. All shop driven rivets within a distance of 425 mm from a shop welded joint shall be driven after the welding is completed. Recapping and caulking of loose or defective rivets will not be permitted. While removing defective rivets care shall be taken not to injure the adjacent metal and if necessary they shall be drilled out.

27. Turned and fitted Bolts

In cases where bolts have to be used but strength of a riveted connection is required the same can be obtained by using special bolts in special holes to a driving fit. The bolts are specially made from black round bars and turned down to the exact diaMetre . The inside of the head and flat face of the nut should be machined. The hole must be accurately drilled or reamed with a clearance of not more than 0.25mm. The holes after assembly of the parts must be true throughout the thickness of all parts and perpendicular to axis of the member. Washer for turned and fitted bolts should be machined on both faces.

28. Drilling and Reaming

Holes shall be accurately located and drilled or reamed perpendicular to the face of the member and if necessary shall be drilled to a template Counter-sunking, where required shall be done carefully and to the full depth of head. Open holes in material of 18 mm or less in thickness shall be sub-drilled or sub-punched before assembly and resumed during assembly. Holes in structural steel more than 18mm in thickness shall be drilled 3 mm smaller than the normal diaMetre of the rivet or bolt before assembly and reamed to the full size during assembly, All members shall be shop assembled before reaming or drilling holes for field connections.

29. Punching

For sub-punching, the diaMetre of the punch shall be 4.5mm smaller than the nominal diaMetre of the rivet or bolt and holes shall be clean without torn or ragged edges.

30. Stress Relieving

Stress Relieving of welded part shall be done where required after all the welding is completed. Machined surfaces of the parts requiring stress relief shall be machined to final dimensions after the parts have been stress relieved. Localised stress reliever will not be permitted for shop welded parts. The procedure for stress reliving shall conform t IS 10801 LS 10234 and IS:2825 (latest edition) Site joints shall also be stress relieved.

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31. Painting and Surface Coating

31.1 General

All paints, painting materials and accessories for painting shall be supplied by the contractor and shall be included in the price Tender . The paints proposed by the contractor must be approved by purchaser or his authorized representative before application of the same. The analysis in respect of paint properties, paint composition and performance requirement of the paints shall be submitted by the contractor for examination and approval. The painting and surface preparation shall also conform to the relevant Indian Standard Specifications of the subject. Decision of the purchaser for the recommendation of such standard shall be final and binding on the contractor.

31.2 Preparation of surface

The preparation of surfaces prior to painting or coating shall be done as outlined below.

a. Weld spatter or any other surface irregularities shall be removed by any suitable means before cleaning.

b. All oil, grease and dirt shall be removed from the surface before blast cleaning.

c. Following the solvent, cleaning the surfaces to be painted shall be cleaned of all rust mill scale, and other lightly adhering objection substances by sand blasting or grit blasting to uniform bright base metal.

d. Surfaces of stainless steel, nickel, bronze and machined surfaces adjacent to the metal work being cleaned or painted shall be protected by masking or by other suitable means during the cleaning and painting operation.

e. Primer shall be applied as soon as the surface preparation is complete and prior to the development of surface rust. The time gap between the application of the primer and surface preparation shall normally not exceed eight hours. In case there is considerable time gap, the surface should be re-blasted prior to priming.

31.3 Painting System

b. Stainless steel and bronze surface shall only be cleaned but not painted.

c. All surfaces of the embedded parts which are to come in contact with concrete shall be cleaned as mentioned above and give two coats of cement latex to prevent rusting during shipment and while awaiting installation.

d. Gates

Perfect cleaning of all surfaces which are not to be covered with concrete shall be carried out by sand blasting to the requirements of SA 2½ of Swedish Standard.

Over the prepared surfaces one coat of Epoxy zinc rich primer by spray (preferably airless spray) should be applied giving a dry film thickness of 40 -60 microns.

The interval between surface preparation and painting shall be as short as practicable and in no case longer than 4 – 8 hours. Over the primer, two coats of coaltar epoxy paint shall be provided at an interval of about 24 hours. Each coat shall give a dry film thickness of 100- 125 microns. The total dry film thickness of all the coats shall not be less than 300 microns.

e. Embedded parts

All unfinished surfaces of embedded parts exposed to atmosphere or water shall be sand blasted to Sa 2½ of Swedish Standard and given a coat of zinc epoxy primer giving a dry film thickness of about 40-60 microns.

31.4 Measures during priming

a. Any bare spots or holidays shall be recoated with additional application of primer.

b. All runs, sags, floods, or dips shall be removed by scrapping and cleaning, the cleaned area should be retouched or all such defects shall be remedied by reblasting or reprimand.

c. Special attention should be given to obtain good coverage on rivets, welds and sharp edges and cover.

d. Suitable measures shall be taken to protect the applied primer from contact with rain, fog, mist dust or other foreign matter until completely hardened and next coat is applied.

e. The air temperature at the time of application must be below 10^0 C and relative humidity must not be above 90%

31.5 Application Procedure

All paints and coating materials shall be in a homogeneously mixed condition at the time of application and shall not be thinned except as hereinafter specifically provided. All surfaces to which paint shall be applied immediately after cleaning not exceeding 8 hours after blasting, then shall be applied by airless spray. When paint is applied by spraying, all precautions shall be provided for removing all free oil and moisture from the air supply line of all spraying equipment. Each coat of paint shall completely cover the surface and shall be free from runs, sags, pinholes an holidays. Each coat of paint shall be allowed to dry or harden thoroughly before the succeeding coat is applied.

32. Catalogues and operating instructions

Three sets of catalogues indicating the complete lists of parts and operating instructions in the English language which may be needed or useful in operation, maintenance, repair, dismantling or assembling and for the repair and identification of parts for ordering the replacement shall be supplied by the contractor to the purchaser. Such catalogues shall be in hard cover bound books and should have suitable jacket of thick polythene paper.

33. Instruction Plates

All gauges, Metre s and other instruments etc., shall have dials or scales calibrated in metric system. all name plates, instruction plates, warning signs, etc. shall be in English as well as in Tamil. All marking to be used shall be submitted to the purchaser for approval before the equipment is marked or labeled.

34. Shop Assembly and test

All gates, frames and appurtenants shall be assembled in the shops to assure accurate fit and proper alignment of all parts and that the over all dimensions and clearance are as covered by these specifications. All the shop connection of gates shall be tested for water tightness prior to shop painting, while the units are assembled, the holes for field connection shall be reamed to full size.

The embedded metal work to be furnished under these specifications shall be shop assembled to the extent possible.

35. SOUNDNESS OF WELDS

One end of he tie bar shall be welded to the anchor girder, using proper sequence of welding to minimize distortion. The welds shall be inspected for soundness by dye penetrant test and shall be locally stress relieved and if necessary shall be tested to the satisfaction of inspecting officer of the purchaser.

36 PREPARATION FOR DESPATCH

36.1 Unit Marking, Match Marking and Transportation Designation

Each part of the gate and embedded parts, which is to be transported as a separate piece shall be marked to show the unit of which it is apart and match - marked to show its relative position in the unit to facilitate assembly in the field. Unit marks and match marks shall be made with heavy steel stamps and paint. Each piece sub- assembly or package transport separately shall be labeled or tagged with transport designation consisting of the specifications number and marks number of such pieces, number of parts grouped of such sub - assemblies or contained in package.

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36.2 Packing

All parts shall be prepared for dispatch so that slings for handling may be attached readily while parts are to be moved. Where it is unsafe to attach slings to the box parts shall be packed with slings attached to the part and slings shall project through the box or crates so that attachment can be made easily. All parts shall be properly secured, packed to withstand handling during transportation. All parts shall be properly secured, packed to withstand handling during transportation. All packing shall allow for easy removal and checking at sites. Special precautions shall be taken to prevent rusting of steel and iron parts during transit.

Suitable methods proposed to be adopted for protected against moisture shall be subject to the prior approval of the purchaser. Each bale or package should contain packing note quoting number and date of contractor's order and the name of office placing the order.

After delivery of material at site, all packing shall become property of the purchase. Notwithstanding anything stated in this clause the contractor shall be entirely responsible for loss, damage on transport to the site, due to faulty and unsecure packing. The equipment shall be insured for loss or damage during transit at the cost of contractor.

37. ERECTION

The equipment covered by these specifications shall be furnished and erected by the contractor at the project site. The contractor shall be required to furnish all erection drawings. The contractor shall prepare a complete erection procedure which shall describe the sequence of operations to be carried out, the method to be used, the measurements to be taken out and the tolerances to be met in the erection and alignment of the equipment. Such procedure shall have approval of the purchaser prior to the commencement of fabrication and when approved form a part of the specification furnished by the contractor.

38.1 Installation of 1st Stage Embedded Parts

The contractor should arrange for embedding of 1st stage embedded parts.

38.2 Installation of 2nd Stage Embedded Parts :

Gate frames, embedded parts, guides and seal seat arrangements etc. shall be assembled and installed, brought to line graded and plumbed within the erection tolerances and secured in place by anchorages as show in the drawings or otherwise according to the best method - in - practice and as may be necessary for successful functioning of these units. The erection tolerances for the frames and guides shall be as indicated on the drawings or as per latest relevant BIS Codes. Extreme care shall be taken to ensure that their surfaces be in a true plane within the tolerance throughout their entire length. The 2nd stage anchorages shall be strong enough to hold the frames and guides securely in position while concrete is being places. The concreting (M.15) ad finishing should be done under this contract.

38.3 Installation of Gate Leaves and Hoists :

It is desirable to avoid the flood prior to perform erection of gates. Should it be necessary to do so due precautions should be taken against floods as the gates may be submerged in water sustaining damages or the half erected gates may disturb the water flow causing damage to the civil structures. One of the measures may be that the hoists should be erected first and when the flood broadcast is made, the half executed gates should be hoisted up, to clear the flooding water.

38.4 Placing of Concrete :

Concreting shall be done by the contractor under this contract for 2nd stage embedment parts and also for raising of pier grooves including finish in and the contractor shall give a detailed programme of fixing and aligning the embedded parts to the purchaser for this purpose. Before placing concrete in any one lift and between placement of successive lights, alignment tolerances shall be checked and remedial action shall be taken by the contractor, if any displacement occurred.

38.5 Erection Personnel

Except of the concreting, skilled, as well as unskilled personnel shall be arranged by the contractor for erection of the equipment covered in the specifications.

38.6 Tools & Tackles

The contractor shall provide all tools & tackles used in the above erection work.

39. Inspection testing and final acceptance:

39.1 Place of Manufacture & Inspection:

The tenderer shall state in his tender, the place of manufacture, testing and inspection of various portions of work included in the contract. Authorized representatives of the purchaser may be present at the time any or all tests and the tenderer shall provide all necessary facilities for the same. Representatives of the purchaser shall also be entitled to access to tenderer's sub - contractor's work at any time during the working hours for the purpose of inspecting the manufacture of equipment and materials.

39.2 Inspection:

All supplies (which include without limitation raw materials, components, intermediate assemblies and end products) shall be subject to inspection and test by the purchaser to the extent practicable at all times and places. Inspection shall be carried out in accordance with relevant Indian Standard.

If any inspection or test is made by the purchaser or in the premises of the contractor or sub - contractor, the contractor without additional charge shall provide all reasonable facilities and assistance for the safety and convenience of inspectors in the performance of their duties. If on the request of the purchaser, inspection or test is made at a place other than the premises of the contractor or sub - contractor of the contractor, it shall be at the expense of the purchaser except as otherwise provided in the contract, provided that in case of inspection, the purchaser shall not be liable for any reduction, in value of samples used in connection with such inspection and test. All inspection and test by the purchaser shall be performed in such a manner as not to unduly delay the work. The purchaser reserves the right to charge the contractor, any additional cost of inspection and test when supplies are not made at the time of such inspection and test. Acceptance on inspection of the supplies shall be made as promptly as practicable after delivery except as otherwise provided in the contract but failure to inspect and accept or reject supplies shall not relieve the contractor for responsibility for such supplies as are not in accordance with the contract requirements.

The inspection and test by the purchaser of any supplies or lots thereof does not relieve the contractor from any responsibility regarding defects or other failure to meet the contract requirements which may e discovered prior to the acceptance. Except as other wise provided in the contract, acceptance shall be conclusive except as regards latent defects, fraud or such gross mistakes as amount to fraud.

The contractor shall provide and maintain the inspection system acceptable to the purchaser covering the supplies hereunder. Records of all such inspection work shall be kept complete by the contractor and made available to the purchaser during the performance of the contract and for such longer period as may be specified elsewhere in the contract.

40. Operational Tests:

The contractor shall carry out in the presence of project authorities such tests on the gate equipment to determine that the gates will fulfill the functions for which they have been designed. Tests shall be repeated, if necessary, until successfully carried out to the satisfactions of the purchaser. Leakage tests and operation tests shall be carried out at the convenience of the project authorities after completion of other portions of the work and when the reservoir is at its full level, the project authorities shall have the right to carry our such tests also when the reservoir is at a level other than the full reservoir level. All lubricants necessary for initial testing of gates should be supplied free of cost by the contractor.

40.1 Dry Test:

Operational tests in dry shall be carried out as soon as possible after completion of erection where all controls and permanent power supply have been connected. The tests shall include at least two complete traverses from the maximum raised position to the full seating position. All adjustments, clearance, brakes etc., shall be checked for proper operation.

40.2 Wet Test:

These tests should simulate the actual operating conditions as closely as possible. At least two complete traverses will be made from the fully closed position to the normal raised position as follows:

(a) When gates are closed, raise gates to their desired open position in steps, not less than one Metre depending upon inflow as decided by the engineer and observe the performance including vibration.

(b) Lower the gates to the fully closed position in steps and observe performance of the gates including vibration.

(c) Check up proper operation of limit switches.

40.3 Leakage Tests:

Leakage tests shall be carried out with the gates lowered on the sill. Before measuring the leakage, the gates shall be raised and lowered several times by a Metre or so in order to dislodge any debris that may have lodged in the side seal seats. The leakage shall then be measured and recorded.

The maximum permissible leakage shall be 10 to 15 liters per minute per Metre length of seal.

40.4 Final Acceptance:

The final acceptance of equipment shall be based on the following

a. Quality of workmanship and material of the equipment

b. Satisfactory operation of the equipment after erection as required under these specifications.

c. Acceptance of various tests or test certificate by the purchaser as mentioned in para 16.2

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ADDITIONAL SPECIAL CONDITIONS

1. The contractor should enclose the drawings and design for the vertical lift gates, wheel arrangements, Seal joints, deck bridge details, Contractor shall also provide methodology .

2. Contractor will submit the Design, fabrication / manufacturing drawings, erection drawings, working methodology and QAP for the scope of work within 90 days after award of work for approval. Any commencement of work (supply / erection) only after approval of documents from concerned authority. Operation and Maintenance Manual for all gates and control system under the scope of work (along with soft copy) shall be submitted by the contractor before the handing over of work.

3. The tender document without sufficient drawings and designs shall be summarily be rejected.

4. The manufactured & fabricated parts wherever mentioned under the scope are to be warranted for a period of 5 years.

5. During the warranty period, any defective component or repair in the manufactured component, it should be replaced & rectified without any liability to the Department.

6. The welding electrodes to be used are of E 7018 of reputed make suitable for joining steel of IS 2602 Grade B or approved by BHEL/concerned authority.

7. The new welding length should be same as that of the existing old welding length and all fillet weld thickness shall not be less than 6 mm.

8. The CSK SS bolts/ Hexagonal SS bolt & nut, seal seat plate, required for renewal of side and bottom rubber seal of gate are to be supplied with IS by the contractor.

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9. Any other consumables, materials, part or equipment required for the completion of the work which are not specifically mentioned in the tender has to be borne by the contractor.

10. All the wastage of steel sections and rolling margin allowances of steel sections supplied by the main producers will be on contractor's account and the contractor should consider this aspect while quoting the rates.

11. The contractor should inspect the site and quarries and satisfy himself about the availability of the quality and quantity of materials and scope required for the work and leads for the materials.

12. The contractor shall make his own arrangement to procure all materials required for the work.

13. The contract period includes Irrigation, monsoon and non-monsoon seasons without any break. South west monsoon (June to September) and North East Monsoon (October to December)

14. Special tools such as special spanners, Sockets or wrenches hand crank necessary for repairs and maintenance for hoists shall be borne by the contractor.

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