

UNA NAGARPALIKA

NOTICE INVITING TENDER

(A) RECEIPT AND OPENING OF TENDER:

Online Tenders are invited on Item rate basis from the established, renowned, reliable and eligible contractors on or before 18.00 hours on 18-06-2026 on website <https://nagarpalikatender.nprocure.com> or www.tender.nprocure.com. The tender received after due time and date specified will not be accepted.

(B) NAME OF WORK:

"PATCHWORK, REPAIRING & RESURFACING OF ASPHALT ROAD, C.C. ROAD & PAVER BLOCK ROAD DUE TO DAMAGE BY HEAVY RAINS IN VARIOUS AREAS OF UNA, DIST. GIR-SOMNATH"

- | | |
|---------------------------|-----------------------------------------------------|
| 1. ESTIMATED COST: | Rs. 5000000.00 (with cost of Materials and Labour). |
| 2. EARNEST MONEY DEPOSIT: | Rs. 50000.00 (Rupees Forty Thousand only) |
| 3. TIME LIMIT: | Twelve Months (including monsoon) |
| 4. Document Fee: | Rs. 2400.00 |
| 5. Registration required: | "E-1" Class & Above |

(C) OPENING OF TENDERS:

The tenders will be opened online in presence of bidders and opening authority subject to receipt of tender fees, EMD and other Documents in hard copy. The tenders will be opened in two stages i.e., Technical Bid and Commercial (price) Bid.

(D) PURCHASE (DOWN LOAD) OF TENDER DOCUMENTS:

Tender Documents can be downloaded from nagarpalika.nprocure.com up to 05-09-2024: 1800 hours. Tender documents fees of Rs. 2400.00 (Rs. Two Thousand Four Hundred only) is required for submission of tender towards the cost of tender documents by pay order or by demand draft of any nationalized bank, in favour of "Chief Officer, Una Nagarpalika, Una" payable at Una and shall be submitted long with EMD and other documents. The cost of the Tender Documents will not be refunded in any circumstances.

(E) TIME LIMIT:

The total time limit for completion of the work shall be Twelve Months including monsoon commencing from the 10th Day of issuance of work order. However, Nagarpalika will continue for the Twelve Months as considered as yearly rate (if required).

(F) Tenderer must comply with and agree to all instructions & requirements in the Notice and in the Instructions to Tenderers, including requirements in the

Contract Documents.

- (a) All tenders must be submitted in the prescribed Tender form.
- (b) Each Tender must be accompanied by the completion Schedule.
- (c) Each tender must be accompanied by the Tender Security (Earnest Money Deposit) Rs. **50000.00 as** specified in the tender documents.
- (d) The successful tenderer shall execute the Contract Agreement within fifteen days after the date of Notice of award.
- (e) The successful Tenderer will be required to furnish a **Security Deposit** of an amount equal to 2.50 % in form of Bank Guarantee / Demand Draft or Pay order of Nationalized / Scheduled Bank in favor of Chief Officer, Una Nagarpalika, Una and remaining 2.50 % Security Deposit will be deducted from R.A. Bills.
- (f) The successful Tenderer will be required to furnish a **performance bond** of an amount equal to (5.00 %) Five percent of the actual bill amount at the time of final bill (completion stage).
- (g) The successful Tenderer shall furnish insurance in accordance with the contract documents.
- (h) The Una Nagarpalika may withhold issuance of the Notice of proceed for a period not exceeding fifteen days after the date of execution of the contract agreement.
- (i) The tender and tender guarantee bond (Earnest Money Deposit) shall be submitted by the Agency in whose name tender has been issued. Transfer of tender documents to any other party is prohibited.
- (j) All intending tenderers will have to purchase digital signatures in order to participate in the online bidding process.

G) RECEIPT OF TENDER DOCUMENTS:

The following details are to be submitted online on <https://nagarpalikatender.nprocure.com> or www.tender.nprocure.com:

- A. Document fees and EMD Details.
- B. Price Bid
- C. Soft copy of Technical and financial details required for evaluation.

The following details shall be submitted in hard copy at prescribed address:

- A. Tender fees in prescribed format
- B. Earnest Money Deposit in prescribed format
- C. Pre-Qualification documents along with all necessary supporting documents

Please note that price bid shall not be submitted in hard copy under any circumstances. This will hold the tender liable for rejection.

(H) TENDER VALIDITY PERIOD:

The validity period of the tender submitted for this work shall be of one hundred twenty (120) calendar days from the date of opening of price bid and the Tenderer shall not be allowed to withdraw or modify the tender offer on his own during the validity period.

(I) RIGHTS RESERVED:

Without assigning any reason, The Una Nagarpalika reserves the right to reject the lowest or any other or all tenders or part of its. To waive any informality or irregularity in any tender, which in the opinion of the Una Nagarpalika does not appear to be in its best interest and the tenderer shall have no cause of action or claim against the Una Nagarpalika or its officers, employee, successors or assignees for rejection of this tender.

The Una Nagarpalika further reserves the right to withhold issuance of the notice to proceed, after execution of the contract agreement by the successful Tenderer. The Una Nagarpalika is not obliged to give reasons for any such action.

During Tender validity period, if any Tenderer withdraws or makes any modifications or additions in the terms and conditions on his own in this tender, then The Una Nagarpalika shall without prejudice to any right or remedy be at liberty to reject the tender and forfeit the Earnest Money Deposit in full. Such Tenderer may be disqualified from tendering for further works under the jurisdiction of The Una Nagarpalika.

The Una Nagarpalika reserves the right to increase or decrease the scope of work and split the tender in two or more parts without assigning any reason even after the award of contract.

SIGNATURE OF THE CONTRACTOR

DATE:

PLACE:

**CHIEF OFFICER
UNA NAGARPALIKA
UNA**

1.0 NOTICE TO INTENDING TENDERER

Tenders on Item rate Basis are invited on behalf of the Una Nagarpalika, Una for the work of **"PATCHWORK, REPAIRING & RESURFACING OF ASPHALT ROAD, C.C. ROAD & PAVER BLOCK ROAD DUE TO DAMAGE BY HEAVY RAINS IN VARIOUS AREAS OF UNA, DIST. GIR-SOMNATH"**

- 1 The estimated cost for this work is **Rs. 5000000.00 only (with cost of Materials and Labour)** The construction is to be carried out as described under memorandum of works in this Tender Document. The whole work is required to be completed within **Twelve Months** (including monsoon) from the date of work order as per the terms of the contract in the document. However, Nagarpalika will continue for the Twelve Months as considered as yearly rate (if required).
- 2 Tenderer shall get acquainted with the site conditions sufficiently in advance of the date fixed for submission of the tender and shall have satisfied himself as to the nature of work to be executed, all the existing roads and access to and from the site work and to the sites for temporary sheds, etc. required for carrying out the work. The tenderer shall be deemed to have full knowledge of all the relevant documents, existing site conditions etc. whether he inspects them or not.
- 3 The tenderer shall submit his tender (except price bid) in a sealed cover (envelope) containing separate sealed covers as below. Each envelope must be duly super scribed with the name of work, tender notice number etc. written on each envelope.
 - i Hard copy of Post qualification bid (Downloaded) with documents duly signed by the contractor on each page.
 - ii Earnest Money Deposit (**Rs.50000.00**) This amount shall be corresponding to the estimated cost for which the bid is quoted by the tenderer.
 - iii Tender documents fee (**Rs.2400.00**) as stipulated in tender documents.
 - iv Hard copy of technical bid (Down loaded) duly signed by the contractor on each page.
- 4 Price bid for the work of the **"PATCHWORK, REPAIRING & RESURFACING OF ASPHALT ROAD, C.C. ROAD & PAVER BLOCK ROAD DUE TO DAMAGE BY HEAVY RAINS IN VARIOUS AREAS OF UNA, DIST. GIR-SOMNATH"**. The contractor shall quote for the works as per price bid (Schedule-B) given in Volume-III. Rate must be quoted in electronic format only online. Rate shall not at all be mentioned elsewhere in the tender documents or other submissions to be made.
- 5 Submission of tender by a tenderer, shall mean that he has read this notice and contract documents and has made himself aware of the scope and specifications of the work to be done and of conditions and nature of required quantities of materials, stores, tools and plant, etc. that may be required by him in carrying out the work and of local conditions and laws and bylaws of the Government, Una Nagarpalika and other factors bearing influences on the execution and cost of the works.

- 6 The total amount shall be written both in figures and in words in ink or ballpen. In the case of figures the words 'Rs.' should be written before the figure of rupees and the word 'paise' after the decimal figure, e.g. Rs. 2.15 and in case of words, the words "Rupees" should precede and the words 'paise' should be written at the end. Unless the amount is in whole Rupees and followed by the word 'only', it should invariably be up to two places of decimal. Tender with erasures, over-writings or alterations or mutilations shall stand rejected.
- 7 The tender shall be accompanied by Earnest Money Deposit of **Rs. 50000.00**. The tenderer shall pay Earnest Money Deposit by pay order / Demand Draft only issued in favour of Chief Officer, Una Nagarpalika - Una through Nationalized Bank only. The earnest money deposit in the form of FDR or Cheque shall not be accepted. The tenderer shall have to mention details of EMD on the sealed cover of EMD and in electronic format. The tender received without EMD shall be outrightly rejected.
- 8
 - i) All pages of tender documents including specifications should be initialed by the Contractor.
 - ii) Tenders shall stand rejected if the tenderer proposes any alteration in the work specified or any condition or correction made in the Schedule -B (Price Bid).
 - iii) The tenders shall stand rejected if any eraser is made in the tender, unauthenticated or any page or a page is / are removed or replaced.
 - iv) **Latest passport size photographs of tenderer or of all partners in case of partnership firm shall be affixed at specified place in the tender.**
- 9 The tenderer shall submit the tender who satisfies each and every condition laid down in this notice and tender documents, failing which, the tender will be liable for rejection.
- 10 The authority inviting the tender reserves the right to accept any or to reject any or all tenders without giving any reasons thereof.
- 11 This notice of inviting tenders shall form part of the contract documents.

Contractor's Signature with address

Date:

Place:

**CHIEF OFFICER
UNA NAGARPALIKA
UNA**

2.0 GENERAL DETAILS OF WORK IN BRIEF

1. Name of Work: **"PATCHWORK, REPAIRING & RESURFACING OF ASPHALT ROAD, C.C. ROAD & PAVER BLOCK ROAD DUE TO DAMAGE BY HEAVY RAINS IN VARIOUS AREAS OF UNA, DIST. GIR-SOMNATH"**

The works are as under:

1.	PATCHWORK, REPAIRING & RESURFACING OF ASPHALT ROAD, C.C. ROAD & PAVER BLOCK ROAD DUE TO DAMAGE BY HEAVY RAINS IN VARIOUS AREAS OF UNA, DIST. GIR-SOMNATH"	5000000.00
	TOTAL	5000000.00
	SAY	5000000.00

2. Estimated cost put to tender: **Rs. 5000000.00**

3. Amount of Earnest Money: **Rs. 50000.00**

Tender envelope to super scribed **"PATCHWORK, REPAIRING & RESURFACING OF ASPHALT ROAD, C.C. ROAD & PAVER BLOCK ROAD DUE TO DAMAGE BY HEAVY RAINS IN VARIOUS AREAS OF UNA, DIST. GIR-SOMNATH"**

Contractor's Signature

Date:

Place:

**CHIEF OFFICER
UNA NAGARPALIKA
UNA**

2.1 MEMORANDUM OF WORKS

1. General Descriptions "PATCHWORK, REPAIRING & RESURFACING OF ASPHALT ROAD, C.C. ROAD & PAVER BLOCK ROAD DUE TO DAMAGE BY HEAVY RAINS IN VARIOUS AREAS OF UNA, DIST. GIR-SOMNATH"

2. Estimated Cost: Rs. 5000000.00

3. Earnest Money: Rs. 50000.00

4. Security Deposit:

A. (Total 5.0% of contract value, this will be deposited as under)

i. Initial S. D. @ 2.50% of contract value: 2.50 % of contract value.
(Not less than EMD) in cash or in the

Form of pay order / DD / FDR / Bank
Guarantee (From the Nationalized Bank
Encashable at UNA Only)

ii. To be deducted from current bills at: 2.50 % of contract value.
10.00% to build up remaining 2.50%
Of SD value

**Total Deposit at 5.00% of contract: 5.00 % of contract
value value**

B. Performance Guarantee

Performance Guarantee @ 5.00% of actual work amount in form of Bank
Guarantee of Nationalized or Scheduled bank. (To be submitted on completion
of work & before final bill payment) Bank guarantee will be released after
defect liability period is over.

**5. Time allowed for completion of work from: Twelve Months including
date fixed in written order to commence monsoon.**

(However, Nagarpalika
will continue for the
Twelve Months as
considered as yearly rate
(if required)).

**6. Compensation of delayed work under: Point two percent per
Clause-4 under Para 5.1 of this document day subject to maximum
of 10% (Ten percent) of
The amount of the
contract value of work.**

**7. The progress of work should confirm to the: 10% of work to be done
following schedule in 25% of time.**

40% of work to be done
in 50% of time

70% of work to be done
in 75% of time

100% of work to be done
in 100% of time

8. Defect liability period:

The **Defect Liability** Period for the work is **One Year** after getting Completion Certificate by the Contractor from the Consultant. Any defect if noticed during the defect liability period shall have to be rectified by contractor at his cost as directed and as per the method approved by consultant. At the time of Final Bill submission for work, the contractor shall have to submit the F.D.R. / N.S.C. / Narmada Bond / Bank Guarantee pledged in favor of Una Nagarpalika for an amount equivalent to 5.00 % of total contract value, which shall be kept valid for a period of defect liability period plus (three) months.

9. Water charges:

Nagarpalika shall not provide any water for the construction or any other purpose for the said works. The contractor shall have to make his own arrangements for supply of water, preferably by own bore well. However, in any case, the quality of water shall meet with the requirements as mentioned in the detail specification. The contractor shall have to inform in writing about the same within 25 days from the date of issue of work order. However, in any case, the quality of water shall meet with the requirements as mentioned in the detail specification.

10. Scope of Work

- (1) The work to be carried out under this contract shall consist of various items as generally described in Tender Documents as well as under schedule-B in Price Bid furnished, under Volume - III
- (2) The rate quoted by contractor shall unless otherwise specified, shall include compliance with/simply of the following.
 - (a) Carrying out construction of all components of the Building & Gardening works as mentioned in sheet No. A-1 of schedule-B under the instruction of Engineer-in-charge.
 - (b) General works such as cleaning site before commencement, set-out the line of works, etc. and clearing the site after completion and before handing over the structure after defect liability period.
 - (c) Collection and providing samples including transportation and carrying out on various constructional materials proposed to be used in the work, all tests as required as per provision of standard specifications and furnish test report/certificates from acceptable testing laboratories.
 - (d) Providing and fixing in inserts, bolts for providing anchorage devices to electricity light poles.
 - (e) Procurement by the contractor all materials of construction required for both temporary works and actual materials to be

supplied by client as per schedule 'A' given in this document as may be necessary.

- (f) Giving programme of work to monitor progress of work and to sort out bottlenecks for lapses etc.
- (g) Complying with any other data, which may be required as per the specifications, conditions, schedule-B etc. forming part of the contract.
- (h) Any other item of work not specifically provided in the contract but which is necessary being contingent in complying with the provisions of the contract.

Contractor's Signature with address

Place:

Date:

**CHIEF OFFICER
UNA NAGARPALIKA
UNA**

2.2 UNDERTAKING ON EARNEST MONEY SURRENDER

I / We hereby tender for carrying out **"PATCHWORK, REPAIRING & RESURFACING OF ASPHALT ROAD, C.C. ROAD & PAVER BLOCK ROAD DUE TO DAMAGE BY HEAVY RAINS IN VARIOUS AREAS OF UNA, DIST. GIR-SOMNATH"**(herein before and herein after referred to a client of the work) as specified in the memorandum & under Price-Bid showing items of work to be carried out within time specified therein and in accordance with all specifications, designs, drawings and instructions in writing referred to in provisions under annexed conditions of contract under contract documents and agree that all materials of construction in the work are to be procured by us. Should this tender be accepted, I / We hereby agree to abide by and fulfill all the terms and provisions of the conditions of contract annexed thereto as fully applicable, and in default thereof, agree to forfeiture of and pay to the client, the sums of Earnest money mentioned in the said conditions.

Receipt No. _____ dated _____ from client, in respect of the sum or Rs. _____ /-
(in words Rupees _____)
deposited, be in the form of Bank Guarantee Rs. _____ /- and Pay Order / Demand Draft drawn for Rs. _____ /- bearing No. _____ dated _____ on the _____
drawn in favour of _____ is herewith forwarded representing the earnest money, the full value of which is to be absolutely forfeited to client, should I/We not deposit the full amount of security deposit specified in the memorandum, and in accordance with clause 1 of para 5.1 of the said conditions, otherwise the said sum of Rs. _____ /- shall be refunded.

Place:

Date:

Address:

**Signature of the contracting agency
submitting the tender**

Signed and given in presence of _____

Address:

Occupation:

**Signature of witness
to the contracting agency**

3.0 INSTRUCTION TO TENDERER

1. General:

The tenderer shall take note of the following.

- a) That any alteration in the work specified in the said tender form of invitation to tender or the time allowed for carrying out the work or any other condition of any sort, shall not be permitted.
- b) That the tenderer's quotations containing condition(s), shall be liable for rejection outright without assigning any reason for the same if so required.
- c) That the tenders with post qualification bid, technical bid and price bid in separate sealed covers duly completed as above, shall be submitted by the "Registered Post", "Acknowledgement Due" or by speed post through postal authority only. The technical and price bids shall contain adequate cross references wherever necessary to ensure clear and proper co-relations without any ambiguity.
- d) That the tenderer shall clearly understand that there will be no deviation(s) in technical specifications or other tender conditions in the tender documents and the price-bid. The Nagarpalika shall not accept any offer submitted by tenderer on its own design whatsoever.
- e) Those conditions if specified in the price-bid, in modifications to those conveyed in the tender shall render the price-bid offered as rejected, without assigning any reason.
- f) That the contractor or his authorized representative shall invariably remain present at the time of opening of bids. Technical bids will be opened first. The time and date of opening of Price Bid will be fixed by the client and will be intimated to the bidder after technical bids are analyzed and clarifications are given.
- g) The client however reserves the right to negotiate further with any or all the tenderer. "In case the tender is conditional and the schedule as above is not given in all respects the tenders shall be treated as incomplete and will stand rejected" The tenderer must clearly understand that the rates quoted are for completed items of work and as such includes all costs associated with labor, materials, shuttering, scaffoldings, plants, equipments, supervision, survey works, power, water, royalties / Octroi / Sales tax / Income tax / GST, and other taxes including octroi, duties etc, that may be levied.
- h) **The income tax, labour cess, sales tax and any other taxes as per Government rule will be deducted from the running account bill as per rules from time to time as applicable.**

SGST / CGST: If any types of GST are levied by the government during the course of execution of this contract the same shall be borne by the Contractor. Una Nagarpalika will not entertain any claim regarding the GSTN.

- i) No claim by the contractor for additional payment will be allowed on the ground of any misunderstanding or misapprehension in respect of technical interpretations of conditions or any such matter or otherwise on the ground of any allegation of fact that incorrect information was given to him in the tender or by any person, whether in the employment of the client or consultant or not, or of the failure on his part, to obtain correct information. The tenderer shall not be relieved of any risks or obligations imposed upon or undertaken by him, under the contract, or any such ground or on the ground that he did not or could not foresee any matter, which may in fact, effect or have affected the execution of the work.
- j) Mobilization advance: No mobilization advance shall be paid to the contractor.**
- k) The contractor shall have to intimate all the agencies for U.G. services like electrical cable, telephone cable, gas pipe line, water / sewage / storm water lines prior to digging and well in advance. Nagarpalika shall extend help to obtain details of underground and other utilities from respective agency. The data available if any shall be informed to contractor. However, all responsibilities for acquiring instruction of utilities and intimation to all agencies shall be lie with contractor.
- l) The contractor shall take utmost care during excavation to protect existing underground utilities. All water main lines / water connections / storm / sewage drains/ house connections, electrical cable, telephone cable, gas pipe line or any other utility and structures shall be protected by contractor. However, if met during excavation, any damages caused shall be rectified by the contractor at the earliest and all the rectification cost shall be borne by the contractor. If the bill for rectification work (if carried out by the concerned agencies / departments) is put by such agencies / department, the same shall be payable by the contractor, if not so it will be deducted and recovered from the running bills to be paid to contractor.

2. Security Deposit:

Where the contractor required submitting F.D.R., bank guarantee, etc. against payment towards any deposit or advancing e.g. EMD, SD, etc., such F.D.R, bank guarantees, etc. shall be produced from any Nationalized / Scheduled bank (other than Co-op. Bank) s only.

Such bank guarantee etc. should been cashable at UNA only.

The remaining amount of the Security deposits i.e. 2.50% of tendered amount shall be recovered from the running account bills at the rate of 5.00% of the gross amount of each bill, so as to make the total Security Deposit of 5.00% of the tendered amount. The amount recovered from the running bills shall not be allowed to be transferred in the form of bank guarantee.

The remaining 50% (2.50% of Security Deposit) of the amount so deducted from RA Bills will be allowed for conversion in the form of interest-bearing fixed deposit receipt, issued in favor of "The Chief Officer, Una Nagarpalika,

Una" by a Nationalized Bank located at Una only. The initial security deposit at 2.50% submitted will be refunded after payment of final bill and remaining 2.50% of security deposit deducted from the running bill will be refunded only after the expiry of defect liability period and after payment of final bill, and after rectifying the defects found, if any, within defect liability period as intimated by Nagarpalika.

If the security deposit is not paid within 15 days from the date of work order, then the penalty at the rate of 0.065% per day of the amount of security deposit will be charged. If, the security deposit is not paid within Two month with interest, necessary actions as per the conditions of contract will be taken.

3. The earnest money of the unsuccessful tenderer's will be returned on finalization of acceptance / rejection of the tenders received or as decided by the Nagarpalika
2. The tenderer is permitted to see plans and estimates in the office of The Chief Officer, Una Nagarpalika, Una, and he is free to discuss any point of doubt, with this authority.
3. It must be clearly and distinctly understood that the conditions of contract and specifications shall be rigidly enforced and no relaxation on the ground of any other customs prevailing shall be allowed.
4. Intimation of acceptance of tender shall be given by a letter sent by Registered Post at the address given below the signature of the tenderer in the bid.
5. **All Taxes:**

Out of the amount payable / Creditable to contractor's account, the central Government / State Government, taxes shall be deducted at source in accordance with the relevant laws / rules prevailing from time to time.

In no case, octroi exemption shall be granted for any of the materials, equipments brought by contractor for execution of the work.

Una Nagarpalika shall not provide "C" Form for the tax purposes.

The rates to be quoted by the tenderer shall be inclusive of all taxes like VAT, sales tax, income tax, duties, etc., including such other taxes, duties, tolls, octroi, freshly levied taxes under any rules during work progress and no claim whatsoever in this context shall be entertained.

Goods / equipments / materials will be permitted for unloading after the submission of octroi receipts.

Out of the "amount payable / creditable to contractor's account, the Central Govt., / State Govt., taxes including VAT shall be deducted at source in accordance with the relevant laws / rules prevailing from time to time.

If any Work Contract Tax or Labor welfare Tax is levied by the Government during the course of execution of this contract the same shall be borne by the Contractor only, though the estimated amount of the tender is inclusive of labour welfare tax @ 1.00 % and is deducted from the every running bill of

the contractor at the rate of 1.00 % of the bill amount.

The Una Nagarpalika shall give a copy of submitted Labour welfare Tax to the Govt. to the contractor on demand.

8. Labour Employment:

The Contractor shall furnish to the Engineer-in-charge every week during the progress of the works classified weekly returns of the number of the people employed on the work during the week. The report of skilled and unskilled labors shall be given in the prescribed form. The contractor shall have to obtain labor license from concerned government department and shall have to submit the undersigned.

The contractor shall strictly observe all the requirements laid down in the contract labor (Regulation and Abolition) Act, 1979 and the contract labor (Regulation and Abolition) (Gujarat) Rules, 1972 and other acts as amended from time to time so far as applicable.

The contractor, if directed by the Engineer-in-charge shall increase or decrease the strength of the labor both skilled and unskilled. The contractor shall also furnish the following returns.

- a) A weekly medical report showing the health of the contractor's labor (skilled or unskilled) camp and the number and the nature of their illness.
- b) A report of any accident, which may have occurred, within 24 hours of its occurrence.

9. Programme through net work technique

- a) The contractor shall furnish a complete detailed BAR CHART incorporating the schedule of progress as per clause 2.1, point no. 7 on memorandum of works, considering all activities right from the award of work to its completion and get it approved from is given. This shall form part of the contract agreement. This programme will be reviewed by the Engineer-in charge, in consultation with the contractor every month and assess the shortfall and decide actions to be taken.
- b) The contractor shall further abide by the following instructions:
 - 1) That he shall associate himself fully for clarifying or evaluating schedule and also for ensuring control or monitoring the progress of the work, as per approved Schedule from time to time.
 - 2) That the contractor shall endeavor to minimize revision of the programme as far as possible after the work gets into the construction.
 - 3) That the contractor shall immediately inform the Engineer-in charge whenever there is or is likely to be, any change in this schedule.
 - 4) That in case of a schedule slippage due to the contractor's inability to perform as contracted, the contractor shall immediately take such action as may be necessary to bring back his work to

schedule without additional cost to the client, either by employing over time operations, increasing the number of shifts, capacity of equipments etc., or as directed by the Engineer-in-charge.

10. Foreign Exchange Requirement:

It should be clearly understood that no foreign exchange sanction will be made available for either purchase of equipments, plants, machineries, material of any kind or any other thing, required for execution of the work. It should also be clearly understood that no request for importing equipments, materials, plants etc. that may be required in carrying out the work, even from Rupee payment countries will be entertained.

11. Relation with Public Authorities:

The contractor shall comply with all obligations arising out of legal orders and directions that may be given to him from time to time, by any local or public authorities and shall pay out of his own money, all charges becoming payable to such authorities. However, Nagarpalika will issue necessary recommendation letter to the contractor for the same, if asked.

12. Water Supply and Electricity:

Soon after receipt of work order awarding the contract, the Contractor for all purposes connected with the execution of work, shall immediately make his own arrangements for obtaining Electricity supply and required supply of water in such quantity and of such quality as such places on the work as may be necessary, by paying charges to the authorities supplying the same after completing all formal procedures as may be required as per the rules with them. The rates quoted in the tender are for completed items of work and shall cover cost of water and electricity as aforesaid. Water for drinking purposes for labourers etc. shall also have to be arranged by the contractor at his own cost. No cost shall be borne by client on this account.

13. Availability of land:

No land is in possession of the client, except for the **"PATCHWORK, REPAIRING & RESURFACING OF ASPHALT ROAD, C.C. ROAD & PAVER BLOCK ROAD DUE TO DAMAGE BY HEAVY RAINS IN VARIOUS AREAS OF UNA, DIST. GIR-SOMNATH"** for housing of labours, office stores, and for due fulfillment of executing the work under contract, contractor shall make his own arrangement for land required and shall bear all expenses for the same, as may be required. The client may render all possible assistance to the contractor to enable him to obtain such lands as may be required for purposes of completion of this work but no guarantee can be given. However, the rent for the same shall be applicable as per Clause No. 36.

14. Setting out:

The contractor shall be solely responsible for the true and proper setting out of the alignment and for the provision of all necessary instruments, at any time during the execution of the work, any error appears or arises regarding location, levels, dimensions, or alignment of any part of the work, the contractor on being required to rectify such errors as may be pointed out by the Engineer-in-charge, shall at his own expense do so, to the satisfaction of

the Engineer-in-Charge. The checking of any setting out of any line or level by the Engineer-in-charge or his representative shall not, in any way, relieve the contractor of his responsibilities for the correctness thereof. The contractor shall carefully protect and preserve all benchmarks, site nails, pegs, reference pillars and other measures used in setting out of the work.

15. Cement Register:

A register is prescribed from, giving details regarding day-to-day receipts of cement consumption in work and balance available on the site, will be maintained at the work site by the Engineer-in-charge. This register shall invariably be signed at the work site by the Engineer-in-charge. This register shall invariably be signed daily by the contractor or his authorized representative in token of its correctness. If the cement brought by the contractor outside the city limit, the same shall be accomplished with octroi paid receipt.

16. Sampling and Testing:

1. a. Contractor shall make all arrangements for collection & transportation from site and testing of samples in sufficient quantities as required and provided in the relevant latest IRC / IS codes at the laboratory approved by the Engineer-in-charge. All these will be at the cost of the contractor.
- b. A register in prescribed Form showing test results of materials and work tests will be maintained at the site of work by the contractor and every entry thereof shall invariably be signed by the contractor or his representative and also by Engineer-in-charge or his authorized representative in token of its correctness.

2. Works & Site Conditions:

1. Location of the Work and approach:

The work under this contract specification and drawings pertains to the Construction, for Una Nagarpalika, Una. The key plan giving details of approximate location of the proposed site is given in the document, for general information to the tenderer.

2. (i) Site Conditions:

It shall be deemed that the contractor has satisfied himself to the nature and location of the work, general and local conditions and particularly those pertaining to transport handling and availability and storage of materials, availability of labour, weather conditions, that he has estimated his cost accordingly and the client will bear no responsibility for the lack of such knowledge of site conditions and also consequences thereof to the Tenderer. The information and the data shown in the drawings and mentioned herein and elsewhere under the contract are furnished for general information only and the client in no case will be held responsible for the strict accuracy thereof or any deductions, interpretations or conclusion drawn there from by the contractor.

1) Climatic Conditions:

The climate in this region is moderately hot. The monsoon depends upon the advent of the south west wind but the normal rainy season commences from early June and lasts up to early October in this region. Occasionally, a shower or two may be expected even earlier. There is generally no rain beyond October though some stray showers may be experienced. The yearly average rain fall in this area is about 60" (1500 mm.)

2) Availability of labour:

Unskilled labour may be available locally and skilled labour may be also being available locally for the work of this type and magnitude.

3) Marketing Centers:

Nearest marketing centers for daily necessities are situated near the work site at UNA city.

4) Housing, Water Supply and Drainage Work etc:

No housing accommodation on hire is likely to be available in this area around the site. The contractor has to make his own arrangements for lands for the housing of these labourers and other employees and for stores and field office at the site of work. Drainage Work, sanitation and water supply for drinking purposes and construction purpose at the site shall also have to be arranged by the contractor at his own cost as may be required.

5) Railway and Postal facilities:

Nearest Railway station is at UNA. A post office is also available at UNA.

3. Materials:

- i. Steel and cement shall not be supplied by Nagarpalika and same shall be procured by the contractor at his own cost. Procurement of and testing certificates for cement and reinforcement steel round bars or high yield strength steel deformed bars as required shall be arranged by the contractor at his own cost from standard, reputed manufacturers only as indicated in SCHEDULE-A.
- ii. The materials of construction shall be procured from the quarries approved by the Engineer-in-charge from quarries as shown in the table I giving statement of approved sources for procurement of materials. The suitability of the same for the required quality, quantity, transport facilities etc. may be ascertained by the tenderer themselves before tendering and rates be quoted accordingly.
- iii. Procurement of all constructional materials including, as per Schedule-A stated above, as required shall be arranged by the contractor at his own cost from standard, reputed manufacturers / suppliers as may be approved by

the client. The Octroi Receipts, royalty receipts, Challans etc., shall have to be submitted by the contractor from time to time to the Nagarpalika.

- iv. The contractor shall themselves arrange for Railway wagons as may be required by them, if so need be. Any delay caused in arranging rail transport will not entitle him for any compensation or extension of time limit.
- v. For expeditious and timely supply of materials when required, the contractor may have to carry materials even by road, if Wagons are not available for carriage by rails, but in that case no claim for extra cost if any, shall be entertained.
- vi. The contractor will have to make his own arrangement for plants, equipments, machineries to be used in the execution of this work well in time after award of the contract.

Contractor's Signature with address

Place:

Date:

**CHIEF OFFICER
UNA NAGARPALIKA
UNA**

3.1 DECLARATION FORM:

We hereby declare that I / We have visited the site and fully acquainted myself / ourselves with the local situations regarding type and quantity of materials, labour, machineries, equipments required and the nature of obstructions like to be met with if any, and other factors associated with the construction of this work, before submitting this tender.

I / We hereby declare that I / We have carefully studied the conditions of contract and / or specifications and documents for this work as included in the tender documents and agree to execute the same accordingly.

I / We declare that my / our near relatives / our business associates are not working under Una Nagarpalika, Una in my capacity of an engineer / or in administerial general staff.

Contractor's Signature with address

Place:

Date:

**CHIEF OFFICER
UNA NAGARPALIKA
UNA**

4.0 GENERAL RULES & DIRECTIONS FOR THE GUIDANCE OF CONTRACTORS:

All additional conditions given in the clauses appearing herein after, shall be deemed to form part of the contract and shall be deemed as supplementary to the same. These additional general conditions shall be binding on the contractor in the same manner as the terms and conditions in this **Item rate contract**.

1. All works proposed to be executed by contractor shall be notified in a form of invitation to tender, signed by the Authority and the tender copy will only be issued to contractors, who have submitted the required details / documents as mentioned in the tender notice.

This form will state the work to be carried out, as well as the date for submitting and opening Tenders, and the time allowed for carrying out the work.

Copies of the specifications, drawings, schedule of items, estimated rates and any other documents required in connection with the work signed by the Chief Officer, Una Nagarpalika, Una for the purpose of Identification, shall also remain open for inspection by contractors at his office at aforesaid address during office hours.

2. **In the event of the tender being submitted by a firm, it must be signed by each partner thereof and in the event of the absence of any partner, it shall be signed on his behalf by a person holding a power-of-attorney authorizing him to do so.**
3. Receipt for payments made on account of any work when executed by a firm, will be signed by the partner, having authority to give effectual receipt for the firm.
4. The Tenderer who submits a tender shall fill up usual **Schedule B - Price Bid** giving in the prescribed space his Item rate. Tenders in which propose any alternation in the work specified in the said form of invitation to tender, or in the time allowed for carrying out the work, or which contain any other conditions of any sort, will be liable to rejection. Tenders (Price Bids) shall have the name of the work written outside the envelope.
5. The client or his duly authorized agent will open price-bids received, in the presence of any intending contractors who may be present at the time. In the event of a tender being accepted, the contractors shall thereupon, for the purpose of identification, sign copies of the specifications and other documents. In the event a tender being rejected the E.M.D. will be refunded on application.
6. The client shall have the right to accept any or reject all or any of the tenders without assigning any reasons thereof.

- 7.** No receipt, for any payment alleged to have been made by a contractor regarding any matter relating to this tender or the contract, shall be valid and binding on client unless it is issued and duly signed by the Concerned Authority.
- 8.** All works shall be measured net by standard and according to the rules and customs of the state PWD / Codes of practices without reference to any local custom etc. and no proposals to adopt alternative method will be accepted. The client's decision as to what is the "usual" method in use will be final.
- 9.** Under no circumstances shall any contractor be entitled to any claim for enhanced rates for any items or materials used for this contract.
- 10.** All corrections and additions or pasted slip should be initiated by the Tenderer.
- 11.** The measurements of works will be taken according to the usual method in use by R&B and / or MOST and no proposals to adopt alternative method will be accepted. The client's decision as to what is the "usual method" in use will be final.
- 12.** Any excise tax levied on the finished product; the excise tax will be reimbursed to the contractor after production of the authentic, attested copies of the same to the Una Nagarpalika within a month.
- 13.** Following detailed specific rules / conditions shall be considered as part of the tender conditions and shall be enforced as such.
 - (a) The Tenderer, if individual, shall have to submit with his tender passport size photo with specimen signature duly attested by the gazetted officer.
 - (b) If the Tenderer is a partnership firm, the Tenderer shall have to furnish partnership-deed, photos of all partners with their specimen signatures duly attested by the gazetted officer. The tender shall be signed by all the partners or person holding appropriate power of attorney. An attested copy of said power of attorney shall be enclosed with the tender.
 - (c) The tender shall have to furnish Sales Tax certificate with proof of residence.
 - (d) Contractor shall furnish receipt of having paid royalty/octroi for all the construction materials brought at site for the said work.
 - (e) The tenderer shall contact the client authority, in cases where any materials can be directly had from the manufacturer.
 - (f) After acceptance of the tender offer by the client, only the representative of the tendering firm who has signed while tendering, will sign the agreement deed and all details of the agreement will be filled up by him. The head of the Department of the client authority shall verify all these entries and one copy thereof shall be furnished to "Account Section" of the client authority.
 - (g) On acceptance of the tender by the client authority, the tender shall

have to furnish while entering into agreement, his or representative's photograph, address and specimen signature, to "Account Section" of the client's office.

- (h) When the contractor or his representative contacts "Accounts Section" of the client authority, for receiving payment, complete check of their specimen signatures/photographs shall be exercised by the "Account Section".
 - (i) When the contractor's representative attends "Account Section" for receiving payment, it shall be verified if letter of authority is given by the personal who has signed agreement and check up his specimen signature, where after payment shall made.
 - (j) The Tenderer, whose tender is accepted by the competent authority of Nagarpalika, shall have to enter into an agreement & give surety on a stamp paper worth as per government norms. The firm or person who is giving surety shall have to submit photograph, proof of property (free hold) & his residence address.
 - (k) The errata addenda and corrigendum to be issued in pursuance of the detailed scrutiny of the tender documents, and as per queries sent by various bidders through E-mail. These errata, addenda and corrigendum shall form the part of tender documents. The same shall be duly signed by the tenderers and is to be sent with the original tender bid over and above the details in the original tender documents the tenderers are to be submitted taking into consideration the details referred to in the said errata, addenda and corrigendum sent.
 - (l) Only successful Tenderer shall have to submit the information required for bank account through **Electronic Clearing System (ECS)** if required.
- 14.** The contractor will submit work programme (on monthly time limit / as directed) and methodology of work & Soil investigation report (S.B.C. reports) within one week after releasing work order from the owner to the consultant, then after consultant shall permit to start the work.
- 15.** The contractor has to submit the Monthly Progress Report within 5 days after ending of each month and have to revised the future work program according to that.
- 16.** The contractor shall submit the preliminary bill as the work progress (as per payment schedule) in writing to the office of Una Nagarpalika in their letter pad.

Contractor's Signature with address

Place:

Date:

**CHIEF OFFICER
UNA NAGARPALIKA
UNA**

4.1 SCHEDULE – A

The Una Nagarpalika shall not issue cement, reinforcement steel or any of the material.

Contractor shall make his own arrangement to procure all materials, cement, reinforcement steel, etc.

The cement to be used shall be 53 grades and out of following brands only:

- 1 Ultra tech
- 2 Ambuja
- 3 Binani
- 4 Sanghi
- 5 Hathi
- 6 Siddhi

On the requirement of reinforcement steel in any case i.e. HYSD bars shall be only following makes and shall be Thermo-Mechanically treated (TMT).

- 1 SAIL
- 2 TATA / TISCO
- 3 KAMDHENU
- 4 NILKANTH
- 5 ESSAR
- 6 ISI Brand TMT

The test certificates regarding its property including indication of its Thermo-Mechanically treated must accompany every lot and shall be submitted to Una Nagarpalika before utilizing the same. Unless and until such certificate is submitted, the steel procure at site will not be allowed to be used.

Cement, Reinforcement steel and other materials:

The cement and steel shall not be issued by Nagarpalika.

- (1) Penalty for cement shall be levied as below against variation than the actual consumption:
 - (a) No penalty if actual total consumption is equal to or more than standard theoretical total consumption. For over consumption of cement, no extra payment shall be made.
 - (b) **As per S.O.R. Rate of Estimates prepares** per MT for the variation less than standard theoretical consumption for Cement.
- (2) The payment for reinforcement bar will be made on theoretical weight basis but not exceeding actual procurement at site. The weight shall be computed on the basis of the length of the steel used in the work multiplied by the standard unit weight of MS / HYSD (TMT) bar as mentioned in IS Code No. 1786.
- (3) No separate payment shall be made for any kind of wastage/excess consumption in the materials.
- (4) Ultimately the liability for assurance of the good quality work as per tender provision lies with the contractor.

Testing of Cement, Steel and other materials:

It should be specifically noted that the Cement, Steel, etc. brought by the contractor at site of work shall be used only after the same is tested at the approved laboratory as per the direction of Engineer-in-charge. The testing of all the materials shall be carried out as per relevant codes of I.S. / I.R.C. / M.O.S.T. All the charge for the transport and testing of the samples etc. shall have to be borne by the contractor. The frequency of testing such material shall be in accordance to the relevant Indian Standards as directed by Engineer-in charge. The contractor shall have to make his own arrangement for transportation of inspecting authorities / agencies / PMC at his own cost.

Contractor's Signature with address

Place:

Date:

**CHIEF OFFICER
UNA NAGARPALIKA
UNA**

IMPORTANT INSTRUCTION TO TENDERER

1

Affix latest passport size photograph of tenderer

Specimen Signature of the contractor

2.

1	2	3	4
AFFIX LATEST PASSPORT SIZE PHOTOGRAPH OF ALL THE PARTNERS IN CASE OF PARTNERSHIP AGENCY.			

Specimen Signature of all partners in case of partnership agency.

- (1) _____ Submission of registered
partnership deed /
(2) _____ Agreement is compulsory
case of partnership agency.
(3) _____
(4) _____

3. Submission of sale tax certificate with proof of residence is compulsory for tenderer.
4. In case of Government royalty applicable to tenderer, it is compulsory to submit a receipt of royalty payment with tender.
5. The Photograph and specimen signature of contractor will be cross checked, when ever contractor receives payment in account section of Nagarpalika.
6. The specimen signature of contractor will be cross checked by Account Department of Nagarpalika in case of representative of contractor along with letter of authority of a person who signed an agreement receives payment.
7. Joint venture firms strictly not permitted to quote the tender.

8. Every partner of the firm shall have to sign the tender documents, otherwise the same will not be considered.
9. Tender once accepted shall be binding to the tenderer even if the formal agreement is not signed.

Contractor's Signature with address

Place:

Date:

**CHIEF OFFICER
UNA NAGARPALIKA
UNA**

4.2 SCHEDULE B: (Vol. III – Price Bid)

MEMORANDUM SHOWING ITEMS OF WORKS TO BE CARRIED OUT

Item No	Quantities estimated but may be more or less	Item work	of	Tendered Rates	Unit	Total according quantities	tendered to	amount estimated
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-As per separate Schedule B (Price Bid) attached separately –

- Note 1:** All works shall be carried out as per Government of Gujarat's P.W.D. Handbook for Building works and our specifications contained in this document and as directed.
- Note 2:** Rates quoted include clearance of site (prior to commencement of work and at its close before handing over) in all respects and hold good for work under all conditions, site, moisture, weather etc.
- Note 3:** Rate and the amount of each item of work shall be given both in figure and words. In case of discrepancy in rates in words and figures, the rates given in words shall be considered as final rates.

Contractor's Signature with address

Place:

Date:

**CHIEF OFFICER
UNA NAGARPALIKA
UNA**

5.0 ADDITIONAL / GENERAL CONDITIONS

All additional conditions given in the clauses appearing herein after shall be deemed to form part of the contract and shall be deemed as supplementary to the same. These additional conditions shall be binding on the contractor in the same manner as other terms and conditions in this Item rate contract. Additional conditions of contract will over-rule the general conditions of contract in case of any conflict.

GC.01 DEFINITION AND INTERPRETATION

1. In the contract (as here in after defined) the following words and expressions shall, unless repugnant to the subject or context thereof, have the following meanings assigned to them.
 - 1.1 The **"Owner / Nagarpalika / Employer"** shall mean **UNA NAGARPALIKA** and shall include its Chief Officer or other Officer authorized by the Nagarpalika and includes owner's successors and assignees.
 - 1.2 The **"Contractor"** shall mean the person or the persons, firm or company whose tender has been accepted by the owner and includes the contractor's legal Representative, his successors and permitted assigned.
 - 1.3.1 **"Consultant"** shall mean **MANISH RUPARELIA** and his / their duly authorized representative (s). In the event of his / their ceasing to be the Consultant for the purpose of this contract, such other person as shall be nominated for the purpose by the owner I employer, not being a person to whom the contractor shall object for reasons considered sufficient by the owner. Provided always that no persons subsequently appointed to be Consultants under this contract shall be entitled to disregard or over rule any decision or approval or direction given or expressed in writing by the Consultant for the time being through Controlling Officer.
 - 1.3.2 **"Structural Engineer"** shall mean **Consultant** and his / their duly authorized to be the Structural engineer for the purpose of this contract. Such other person as shall be nominated for representative(s) or in even of his / their ceasing that purpose by the owner, not being a person to whom the contractor shall object for reason considering to be sufficient by the owner. Provided always that no persons subsequently appointed to be Structural Engineer under this Contract shall be entitled to disregard or over rule any decision or approval or direction given or expressed in writing by the Structural Engineer for the time being through Controlling Officer.
 - 1.3 The **"Engineer-In-Charge"** shall mean the person designated as such by the owner from time to time and shall include those who are expressly authorize by the Chief Officer to act for and on its behalf for all functions pertaining to the operation of this contract.
 - 1.5 **"Engineer-In-Charge's Representative"** shall mean any resident Engineer or Assistance to the Engineer-in-Charge appointed from time to time by the owner to perform duties set forth in the Tender document whose authority shall be notified in writing to the contract by the Engineer-In-Charge.

- 1.6 **"Tender"**, the offer or proposal of the Tenderer submitted in the prescribed form setting forth the prices for the work to be performing, and the details thereof.
- 1.7 **"Contract Price"** shall mean total money payable to the contractor under contract document.
- 1.8 **"Addenda"** shall mean the written or graphic notices issued prior to submission of tender which modify or interpret the contract document.
- 1.9 **"Contract Time"** - The time specified for the completion of work.
- 1.10 **"Contract"** shall mean agreement between the parties for the execution of works including therein all contract documents.
- 1.11 **"Contract Document"** shall mean collectively the tender documents, designs, drawings, specifications, agreed variations, if any and such other documents constituting the tender and acceptance thereof.
- 1.12 **"The Sub-Contractor"** shall mean any person, firm or company (other than the Contractor) to whom any part of the work has been entrusted by the Contractor with the written consent of the Engineer-in-charge and the legal representative successors and permitted assignee of such person, firm or company.
- 1.13 The **"Specifications"** shall mean all directions, the various technical specifications, provisions and requirements attached to the contract which pertain to the method and manner of performing the work, to the quantities and qualities of the work and the materials to be furnished under the contract for the work and any order(s) or instruction(s) there under. It shall also mean the latest Indian Standard Institute Specification relative to the particular work or part thereof, as far as they are not contrary to the Tender specifications and in absence of any other country applied in Indian as a matter of standard Engineering practice and approved in writing by the Engineer-in-Charge with or without modification.
- 1.14 The **"Drawings"** shall include maps, plans, tracings, or prints thereof with any modification approved in writing by the consultants, Engineer-in-Charge and such other drawings as may, from time to time, be furnished or approved in writing by consultants, Engineer-in-Charge in connection with the work.
- 1.15 The **"Work"** shall mean the works to be execute in accordance with the contract or the part thereof as the case may be and shall include extra, additional, altered or substituted works as required for the purpose of the contract. It shall mean the totality of the work by expression or implication envisaged in the contract and shall include all materials, equipment and labor required for or relative or incidental to or in connection with the commencement, performance and completion of any work and / or in Nagarpalika in the work.
- 1.16 The **"Permanent Work"** shall mean works which will be incorporated in and form part of the work to be handed over to the owner by the contractor on completion of the contract.

- 1.17 The **"Temporary Work"** shall mean all temporary works of every kind required in or about the execution, completion and maintenance of the work.
- 1.18 **"Site"** shall mean the land and other places, on, under, in or through which the permanent works are to carry out and any other lands or places provided by the Nagarpalika for the purpose of the contract together with any other places designated in the contract as forming part of the site.
- 1.19 **"The Construction Equipment"** shall mean all appliances I equipment of whatever nature required in or for execution, completion or maintenance of works or temporary works (as here in before defined) but does not include materials or other things intended to form or forming part of the permanent work.
- 1.20 **"Notice in writing or written Notice"** shall mean a notice written, typed or in printed form delivered personally or sent by Registered post to the last known private or business address or Registered Office of the Contractor and shall be deemed to have been received in the ordinary course of post it would have been delivered.
- 1.21 The **"Alteration / variation order"** shall mean an order given in writing by the Engineer-in-charge to effect additions or deletions from or alterations in the work.
- 1.22 **"Final Test Certificate"** shall mean the final test certificate issued by the owner within the provisions of the contract.
- 1.23 The **"Completion Certificate"** shall mean the certificate to be issue by the Engineer-in-Charge consultant (when the work has been completed and tested to his satisfaction.
- 1.24 The **"Final Certificate"** shall mean the final certificate issued by the Engineer-in-Charge after the period of defects liability is over and the owner finally accepts the work.
- 1.25 **"Defects Liability Period"** shall mean the specified period between the issue of completion certificate and the issue of final certificate during which the contractor is responsible for rectifying all defects that may appear in the works.
- 1.26 **"Approved"** shall mean approved in writing including subsequent confirmation in writing of previous verbal approval and "Approval" means approved in writing including as previously mentioned.
- 1.27 **"Letter of Acceptance"** shall mean intimation by a letter to tenderer that his tender has been accepting in accordance with the provisions contained therein.
- 1.28 **"Order"** and **"Instruction"** shall respectively mean any written order or instruction given by the Engineer-in-charge within the scope of his powers in terms of the contract.
- 1.29 **"Running Account Bill"** shall mean a bill for the payment of "On Account" money to the contractor during the progress of work based on work done and the supply of non-perishable materials to be incorporate in the work.

- 1.30 **"Security Deposit"** shall mean the deposit to be held by the owner as security for the due performance of the contractual obligations.
- 1.31 **"The Appointing Authority"** for the purpose of Arbitration shall be the Chief Officer, Una Nagarpalika.
- 1.32 **"Retention Money"** shall mean the money retained from R.A. Bills for the due completion of the "LET WORK".
- 1.33 Unless otherwise specifically stated, the masculine gender shall include the feminine and neuter genders and vice-versa and the singular shall include the plural vice-e-versa.

GC.02 LOCATION OF SITE AND ACCESSIBILITY

Non-availability of access roads in no case shall be the cause to condone delay in the ion of the work or be the cause for any claim or extra compensation. The work is to be Carrey out at mentioned below:

Sr. No.	Name of Work	Location
1	RESTORATION, REPAIRING & RESURFACING OF ASPHALT ROAD, C.C. ROAD & PAVER BLOCK ROAD	VARIOUS AREAS OF UNA, DIST. GIR-SOMNATH

GC.03 SCOPE OF WORK

The scope of work is to be defining broadly in the special conditions of contract and specifications. The Contractor shall provide all necessary materials, equipment, labor etc. for the execution and maintenance of the work until completion. The Engineer-in-charge shall approve all material go with the work prior to procurement and use.

POWER SUPPLY

The Contractor shall make his own arrangement for Power Supply.

LAND FOR CONTRACTOR'S FIELD OFFICE, GODOWN, ETC.

Owner will not be in a position to provide land required for Contractor's field office, godown, etc. The Contractor shall have to make his own arrangement for the same.

GC.04 RULLING LANGUAGE

The language according to which the contract shall be constructed and interpreted shall be English. All entries in the contract documents and all correspondence between the contractor and the Nagarpalika or the Engineer-in-charge shall be in English. All ions for the materials shall give in metric units only.

GC.05 INTERPRETATION OF CONTRACT DOCUMENTS

- The provision of the General Conditions of Contract and special conditions of contract shall prevail over those of any other documents of the contract unless specifically provided otherwise, should have there be any discrepancy, inconsistency, error or omission in the several documents forming the contract, the matter may be referred to the Engineer-in-charge for his

instructions and decision. The Engineer-in-Charge's decision in such case shall be final and binding to the contractor.

2. Works shown upon the drawings but not described in the specifications or described in the specifications without showing on the drawings shall taken as described in the specification and shown on the drawings.
3. The headings and the marginal notes to the clause of these General Conditions of contract or to the specifications or to any other part of tender documents are solely for giving a concise indication and not a summary of contents thereof. They shall never seem to be part thereof or be use in the interpretation or construction of the contract.
4. Unless otherwise states specifically, in this contract documents the singular shall include the plural and vice versa wherever the context so requires. Works imparting persons shall include relevant Nagarpalika's/body of individual/firm of partnership.
5. Notwithstanding the subdivision of the documents into separate sections and volumes, every part of each shall be supplementary to and complementary of other part and shall be read with and into the context as far as it may be able to do so.
6. Where any portion of the General Conditions of Contract is repugnant to or at variance with any provisions of the special conditions of contract, then, unless different intention appears, the provisions of the special conditions of contract are deem to override the provisions of General Condition of Contract to extent of each repugnancy of variance.
7. The materials, design, and workmanship shall satisfy the relevant ISS, and codes referred to if additional requirements are sheen in the specifications, the same shall be satisfied over and above ISS and other codes.
8. If the specifications mention that the contractor shall perform certain work or certain facilities, it shall mean that the contractor shall do so at his own cost
9. **CONTRACTOR TO CERTAIN HIS OWN INFORMATIONS**

The details given in the tender are arranged making necessary investigations for framing an estimate. However, when the work being execute, changes in soil conditions are likely to be meet with in view of the formation of soil, strata in UNA District. It is, therefore, desirable that the contractor makes his own investigations or additional investigations as may be required for correctly assessing the cost of different items of work and submit his tender accordingly. Any change in description or quantity of an item shall not vitiate the contract or release the contractor from executing the work comprised in the contract according to the drawings and specification at the tendered rates.

He is deemed to have known the scope, nature and magnitude of the work and the requirements of materials and labor involved and as to whatever work he has to complete in accordance with the contract. The Contractor is expected to visit the site and surroundings to satisfy himself as to the nature of all existing structures, if any, and also as to the nature and the conditions of railways, roads, bridges and culverts, means of transport and communications whether by land, air or water and as to possible interruptions

thereto and the access and gross from the site, to have examined and satisfied himself as to the sites for obtaining sand, stones, bricks and other materials, the site for disposal of surplus materials, the available accommodation and make such enquiries as may be necessary for executing and completing the work, to have local enquiries as to the sub-soil, subsoil water and variation thereof, storms, prevailing winds, climatic conditions and all other similar matters, effecting work. He is expected to be familiar with his liability for payment of Government taxes, customs and excise duty, Octroi and other charges etc. in contract with the execution of this contract. The Government shall give a certificate for this in the Appendix - III.

GC.06 CONTRACTOR TO UNDERSTAND HIMSELF FULLY

The contractor by tendering shall be deemed to have satisfied himself, as to all considerations and circumstances affecting the tender price, as to the possibility of executing the works as shown and described in the contract and to have fixed his according to his own view on these matters and to have understood that no additional allowances except as otherwise expressly provided, will afterwards be beyond the contract price. The contractor shall be responsible for any misunderstanding or incorrect information, however, obtained.

GC.07 ERRORS IN SUBMISSIONS

The contractor shall be responsible for any errors or omissions in the particulars plied by him, whether such particulars have been approved by the Engineer-in charge or not.

GC.08 SUFFICIENCY OF TENDER

The contractor shall be deemed to have satisfied himself before tendering as to the correctness of the tender rates which rates shall, except as are otherwise provides for, cover all the contractor's liabilities and obligations set forth or implied in the contract for the proper execution of the work for compliance with requirements of Article GC.19 thereof.

GC.09 DISCREPANCIES

The drawings and specifications are to be considered as mutually explanatory of each other, detailed drawings being followed in preference to small-scale drawings and figured dimensions in preference to scale and special conditions in preference to General Conditions. The special directions or dimensions given in the specifications shall supersede all else. Should any discrepancies however, appear or should any misunderstanding arise as to the meaning and intent of the said specifications or drawings, or as to the dimensions or the quality of the materials or the due and proper execution of the works, or as to the measurement or quality and valuation of the work executed under this contract or as extra there upon, the same shall be explained the Engineer-in-charge and his explanation shall subject to the final decision of the Chief Officer in case reference be made to it, be binding upon the contractor and the contractor shall execute the work according to such explanation and without addition or to deduction from the contract price and shall also do all such works and things necessary for the proper completion of the works as implied by the drawings specifications, even though such works and things are no specially shown and described in said specifications. In cases where no particular

specifications are given any article to be used under the contract, the relevant specifications of the Indian Standard Institution shall apply.

GC.10 PERFORMANCE GUARANTEE (SECURITY DEPOSIT)

1. A sum of 5.00 % of the accepted value of the tender shall be deposited by the tenderer for each Scheme separately (hereinafter called the contractor when tender is accepted) as security deposit with the owner for the faithful performance, completion and maintenance of the works in accordance with the contract documents and to the satisfaction of the Engineer-in-charge and assuring the payment of all obligations arising from the execution of the contract. This shall be deposited in one of the forms mentioned below
 - a. By a Demand Draft on the UNA Branch of any Scheduled 'A' Bank.
 - b. A Fixed Deposit Receipt of a Nationalized Bank or Government securities duly endorsed in favor of the Una Nagarpalika, Una.
 - c. By a Bank Guarantee of any Nationalized Bank to be cashed at UNA.OR
 - d. The contractor may pay 2.50% of the value of work as initial security deposit and the balance 2.50% shall be recovered in installments through deductions at the rate of 10.00% (ten percent) of the value of each running account bill till the total security deposit amount is made up. However, if the value of the work as per actual execution exceeds the accepted value of tender because of allotment of further work, further recoveries towards security deposit shall be affected at 10.00% of the R.A. bills to make up the Five percent security deposit of the revised value of contract. Alternatively, the contractor may at his option deposit the full amount of five (5) percent of security deposit within ten days of receipt by him of the notification accepting the tender in the form as aforesaid.
2. If the contractor, sub-contractor or their employees shall break, deface or destroy any property belonging to the owner or other agency during the execution of the contract, the same shall be made good by the contractor at his own expense and in default thereof, the Engineer-in-charge may cause the same to be made good by other agencies and recover expense from the contractor (for which the certificate of the Engineer-in-charge shall be final). These expenses can be recovered from the security deposit if recovery from other one source is not possible. The amount as reduced in security deposit will be made good by deduction from the next R.A. Bill of the Contractor.

GC.11 INSPECTION OF WORK

1. Engineer-in-Charge shall have full power and authority to inspect the work at any time wherever in progress either on the site or at the contractor's or any manufacturer's workshop or factories wherever situated and the contractor shall afford to Engineer-in-charge every facility and assistance to carry out such inspection, contractor or his authorized representative shall, at all time during the usual working hours and all times when so notified, remain present to receive orders and instructions.

Orders given to contractor's representative shall be considered to have the same force as if they had been given to the contractor himself. Contractor shall give not less than ten (10) days notice in writing to the Engineer-in-charge before covering up or otherwise placing beyond reach of inspection and measurement, any work in order that the same may be inspected and measured. In the event of breach of the above, the same shall be uncovered at contractor's expenses for carrying out such inspection or measurement.

2. No material shall be dispatched from contractor's store on site of work before obtaining approval in writing of the Engineer-in-charge. Contractor shall provide at all times during the progress of work and maintenance period of proper means of access with ladders, gangways, etc. and make necessary arrangement as directed for inspection or measurement of work by Engineer-in-charge.

GC.12 DEFECT LIABILITY

1. The defect liability of the work shall be One Year for the works. Any defect if noticed during the defect liability period shall have to be rectified, at his cost as directed and as per the method approved by Consultant. After completion of work the contractor shall have to submit the F.D.R. / N.S.C. / Narmada Bond pledged in favor of Una Nagarpalika for an amount equivalent to 5.00 % of total contract value, which shall be kept valid for a period of defect liability period until the maintenance period is over.
2. From the commencement to completion of work contractor shall take full responsibility for the care of the work including all temporary works and in case any damages, occur from any cause whatsoever he shall at his own cost, repair and make good the same so that on completion, work shall be in good order and in conformity, in every respect, with the requirements of contract and as per the instructions of the Engineer-in-charge.
3. If at any time before the work is taken over, the Engineer-in-charge shall -
 - a) Decide that any work done or materials used by the contractor are defective or not in accordance with the contract or that work or any portion thereof is defective or do not fulfill the requirements of contract (all such materials being herein after called defects in this clause) he shall, as soon as reasonably practicable, give notice to contractor in writing of the said defect specifying particulars of the same then contractor shall at his own expense and with all speed make good the defects so specified.
 - b) In case contractor fails to do so, owner may take, at the cost of the contractor, such steps as may in all circumstances be reasonable to make good such defects. The expenditure so incurred by owner will be recovered from the amounts due to contractor. The decision of Engineer-in-charge with regard to the amount to be recovered from contractor will be final and binding on the contractor.

GC.13 POWER HAVE ENGINEER-IN-CHARGE TO GIVE FURTHER INSTRUCTIONS

The Engineer-in-charge shall have the power and authority from time to time and at times to give further instructions and directions as may appear to him necessary proper for the guidance of the contractor and the works and efficient execution of works according to the terms of the specifications, and the contractor shall receive, execute, obey and be bound by the same, according to the true intent and meaning thereof, as fully and effectively as though the same had accompanied or had been mentioned or referred to in the specifications. No work which radically changes the original nature of the contract shall be ordered by the Engineer-in charge and in the event of any deviation being ordered, which in the opinions of the tractor changes the original nature of the contract, he shall nevertheless carry it out and any disagreement as to the nature of the work and the rate to be paid to thereof shall be resolved.

The time of completion of works shall, in the event of any deviations being ordered resulting in additional cost or reduction in cost over the contract sum, be extended or reduced reasonably by the Engineer-in-charge. The Engineer-in-charge's decision in the case shall be final and binding.

GC.14 PROGRAMME

The time allowed for execution of works shall be the essence of the contract. The contract period shall commence from the date of notice of intimation to proceed. The tenderer at the time of submitting his tender shall indicate in the construction schedule his programme of execution of work commensurate with the total time specified. The contractor shall provide the Engineer-in-charge a detailed programme of time schedule for execution of the works in accordance with the specifications and the completion date. The entire programme to be finalized by the contractor has to conform to the execution period mentioned along with the Bill of quantities in the tender documents. The Engineer-in-charge upon scrutiny of such submitted Programme by contractor, shall examine suitability it to the requirement of contract and suggest modifications, if found necessary. A bar chart is to be submitted by the Contractor.

GC.15 SUBLETTING OF WORK

No part of the contract nor any share of interest thereon shall in any manner or degree be transferred, assigned or sublet by the contractor directly or indirectly to any person, firm or Nagarpalika whosoever except as provided for in the succeeding sub-clause, without the consent in writing of the owner.

GC.16 SUB-CONTRACTS FOR TEMPORARY WORKS, ETC.

The owner may give written consent to sub-contractors for execution of any part of the works at the site, being entered upon the contractor provided each individual contract is submitted to the Engineer-in-charge before being entered into and is approved by him. List of sub-contractors to be supplied.

Notwithstanding any subletting with such approval as aforesaid and notwithstanding the Engineer-in-charge shall have received of any sub-contractors, the contractor shall be and shall remain solely responsible for the quality and proper and expeditious execution of the works and the performance of all the conditions of contract in all respects as if such subletting or subcontracting had not taken place and as if such work had been done directly by the contractor.

GC.17 TIME FOR COMPLETION

1. The work covered under this contract shall be commenced from the date the contractor is served with a notice to proceed with the work and shall be completed before the date as mentioned in the time schedule of work. The time is the essence of the contract and unless the same is extended as mentioned in clause G.C. 18 'Extension of Time', the contractor shall pay liquidated damages for the delay.
2. The general time schedule for construction is given in the tender document. Contractor shall prepare a detailed weekly or monthly construction Programme in consultation with the Engineer-in-charge soon after the agreement and the work shall be strictly executed accordingly.

The time for construction includes, the time required for testing, rectification, if any, retesting and completion of the work in all respects to the entire satisfaction of the Engineer-in-charge.

GC.18 EXTENSION OF TIME

Time shall be considered as the essence of the contract. If, however, the failure of the contractor to complete the work as per the stipulated dates referred to above arises from delays on the part of Nagarpalika in supplying the materials or equipment, it has undertaken to supply under the contract or from delays on the quantity of work to be done under the contract, or force major an appropriate extension of time will be given by Nagarpalika. The contractor shall request for such extension within Two month of the cause of such delay and in any case before expiry of the contract period.

GC.19 CONTRACT AGREEMENT

The successful tenderer shall enter into and execute the contract agreement within 10(ten) days of the notice of award, in the form shown in tender documents with such modifications as may be necessary in the opinion of the Nagarpalika. It shall be incumbent on the contractor to pay the stamp duty and the legal charges for the preparation of the contract agreement.

GC.20 LIQUIDATED DAMAGES

If the contractor fails to complete the work or designated part thereof by the stipulated completion date for the work or for that part, he shall pay liquidated damages at half a percent of contract value for each week of delay subject to maximum of 10% of the contract value or as decided by Chief Officer.

The contractor shall complete one-sixth quantum of work within one Ninth period, Nine-tenth quantum of work within one-half period and eight-tenth quantum of work within three-Ninth period, failing which the contractor shall be liable to pay liquidated damages an amount as specified above, or as decided by Chief Officer.

The amount of liquidated damaged shall, however, be subjected to a maximum of 10 percent of the contract value. Delays in excess of eight (8) week shall be a cause for termination of the contract and forfeiture of all security for performance.

GC.21 FORFEITURE OF SECURITY DEPOSIT

Whenever any claim against the contractor for the payment of a sum of money out under the contract arises, the Nagarpalika shall be entitled to recover such sum by appropriating in part or completely, the security deposit of the contractor. In case they deposit is insufficient, the balance recoverable shall be deducted from any then due or which at any time thereafter may become due to the contractor. The tractor shall pay to the owner on demand any balance remaining due.

GC.22 ACTION OF FORFEITURE OF SECURITY DEPOSIT

In any case in which under any clause or clauses of the contract, the contractor shall forfeit the whole of his security deposit or have committed a breach of any the terms contained in this contract, the owner shall have power to adopt any of following courses as he may deem best suited to his interest.

- (a) To rescind the contract (of which rescission notice in writing to the contractor under the hand of the owner shall be conclusive evidence) in which case the security deposit of the contractor shall stand forfeited and be absolutely at the disposal of the security deposit of the contractor shall stand forfeited and be absolutely at the disposal of the owner.
- (b) To employ labor and to supply materials to carry out the balance work debiting contractor with the cost of labor employed and the cost of materials supplied for which a certificate of the Engineer-in-charge shall be final and conclusive against the contractor and 10.00 % of costs on above to cover all departmental charges and crediting him with the value of work done at the same rates as if it has been carried out by the contractor under the terms of his contract. The certificate of Engineer-in-charge as to the value of the work done shall be final and conclusive against the contractor.
- (c) To measure up the work of the contractor and to take such part thereof as shall be unexecuted out of his hand and give it to another contractor to complete, the same. In this case the excess expenditure incurred than what would have been paid to the original contractor, if the whole work had been executed by him, shall be borne and paid by the original contractor and shall be deducted from any money due to him by the owner under the contract or otherwise and for the excess expenditure, the certificate of the Engineer-in-charge shall be final and conclusive.

In the event any of the above courses being adopted by the owner, the contractor shall have no claim for compensation for any loss sustained by him by reason of his having purchased or procured any materials or entered into any agreements or made any advance on account of or with a view to the execution of the work or the performance of the contract.

In purchase, the contractor shall not be entitled to recover or be paid any sum for any work actually performed under this contract unless the Engineer-in-charge will certify in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to be paid the value so certified.

In the event of the owner putting in force the powers as stated in a, b, c, above in him under the proceeding clause, he may, if he so desires, take possession or any tools and plant, materials and stores in or upon the works or the site belonging to

the contractor, or procured by him and intended to be used for execution of the work or any part thereof paying or allowing for the same in account at the contract rates to be certified by the Engineer-in-charge. The Engineer-in-charge may give notice in writing to the contractor or his representative requiring to remove such tools, plant, materials or stores from the premises within the time specified in the notice and in the event of the contractor failing to comply with any notice, the Engineer-in-charge may remove them at the Contractor's expenses sell them by auction or private sale on account of the Contractor and his risks in respects without any further notice as to the date, time or place of the sale and the certificate of Engineer-in-charge as to the expense of any such removal and the amount of the proceeds and the expenses of any such sale shall be final and conclusive against the contractor:

GC.23 NO COMPENSATION FOR ALTERATION IN ON RESTRICTION IN WORK

If at any time from the commencement of the work, the owner shall for any reasons whatsoever not require the whole work or part thereof as specified in the tender to be carried out, the Engineer-in-charge shall give notice in writing of the fact to the contractor, who shall have no claim to any payment or compensation whatsoever on account of any profit or advantage which he might have derived from the execution of the work in full but which he did not derive in consequence of the full amount of the work not having been carried out. He also shall not have any claim for compensation by reasons of any alterations having been made in original specifications, drawings, designs and instructions, which shall involve any curtailment of the work, as originally contemplated.

When the contractor is a partnership firm, the prior approval in writing of the owner shall be obtained before any change is made in the constitution of the firm. Where the contractor is an individual or a Hindu Undivided Family or business concern, such approval as aforesaid shall, likewise be obtained before contractor enters into an agreement with other parties where under, the reconstituted firm would have the right to carry out the work hereby undertaken by the contractor. In either case if prior approval as aforesaid is not obtained, the contract shall be deemed to have been allotted in contravention of subletting cause hereof and the same action may be taken or the same consequence shall ensure as provided in the subletting clause.

GC.24 IN THE EVENT OF DEATH OF CONTRACTOR

Without prejudice to any of the rights or remedies under the contract, if the contractor dies, the owner shall have the option of terminating the contract without compensation to the contractor.

GC.25 MEMBERS OF THE OWNER NOT INDIVIDUALLY LIABLE

No official or employee of the owner shall in any way be personally bound or liable for the acts or obligation of the owner under the contract, or answerable for any default or omission in the observance or performance of any of the acts, matters or things, which are herein, contained.

GC.26 OWNER NOT BOUND BY PERSONAL REPRESENTATIONS

The contractor shall not be entitled to any increase on the schedule of rates or any other rights, claims whatsoever due to representation, promise, or guarantees given or alleged to have been given to him by any person.

GC.27 CONTRACTOR'S OFFICE AT SITE

The contractor shall provide and maintain an office at the site for the accommodation of his agent and staff and such office shall remain open at all reasonable hours to receive information's, notices or other communications.

GC.28 CONTRACTOR'S SUBORDINATE STAFF AND THEIR CONDUCT

1. The contractor on award of the work shall name and depute a qualified Engineer, having experience of carrying out work of similar nature, whom equipments, materials, if any, shall be issued and instructions for work given. The contractor shall also provide to the satisfaction of Engineer-in-charge sufficient and qualified staff, competent sub-agents, foreman and loading hands including those specially qualified by previous experience to supervise the type of works comprised in the contract in such manner as will ensure work of the best quality and expeditious working. If, in the opinion of the Engineer-in-charge, additional properly qualified supervision staff is considered necessary, it shall be employed by the contractor without additional charge on account thereof. The contractor shall ensure to the satisfaction of the Engineer-in-charge that sub-contractors, if any, shall provide competent and efficient supervision over the work entrusted to them.
2. If and whenever any of the contractor's or sub-contractor's agents, sub-agents, assistants, foreman or other employees shall, in the opinion of Engineer-in-charge, be guilty of any misconduct or be incompetent or insufficiently qualified or negligent in the performance of their duties or that in the opinion of the owner or Engineer-in-charge, it is undesirable for administrative or any other reason for person or persons to be employed in the works, the contractor if so directed by the Engineer-in-charge, shall at once remove such person or persons from employment thereon. Any persons or persons so removes shall not again the reemployed in connection with the works without the written permission of the Engineer-in-charge. Any person, so removed from the works shall be immediately replaced at the expense of the contractor by a qualified and competent substitute. Should the contractor be required to repatriate any person removed from the works he shall do so after approval of Engineer-in-charge and shall bear all costs in connection there with?
3. The contractor shall he responsible for the proper behavior of all the staff, foreman, workmen and others and shall exercise proper control over them and ii particular and without prejudice to the said generality, the contractor shall be bound to prohibit and prevent any employee from trespassing or acting in any way detrimental or prejudicial to the interest of the community or of the properties or occupiers of land and properties in the neighborhood and in the event of such employees so trespassing, the contractor shall be responsible therefore and relieve the owner of all consequent claims, actions for damages or injury or and other grounds whatsoever. The decision of the Engineer-in-charge upon and matter arising under these claims shall be final.
4. If and when required by the owner, the contractor's personnel entering upon the owner's premises shall be properly identified by badges of a type acceptable to the owner which must be worn at all times on owner's premises.

GC.29 TERMINATION OF SUBCONTRACT BY OWNER

If any subcontractor engaged upon the works at the site execute any work which in the opinion of Engineer-in-charge is not in accordance with the contract documents the owner may by written notice to the contractor request him to terminate such contract and the contractor upon the receipt of such notice shall terminate such sub-contracts and the latter shall forthwith leave the works failing which the owner shall have the right to remove such subcontractors from the site.

No action taken by the owner under the above clause shall relieve the contractor of his liabilities under the contract or give rise to any right to compensation, extension time or otherwise.

GC.30 POWER OF ENTRY

If the contractor shall not commence the work in the manner previously described in the contract documents or if he shall at any time, in the opinion of Engineer-in-charge.

- (i) Fail to carry out works in conformity with the contract documents, or
- (ii) Fail to carry out the works in accordance with the time schedule or
- (iii) Substantially suspend work or the works for a period of seven days without authority from Engineer-in-charge or
- (iv) Fail to carry out and execute the work to the satisfaction of the Engineer-in-charge, or
- (v) Fail to supply sufficient or suitable construction plant, temporary works, labor, materials or things or
- (vi) Commit breach of any other provisions of the contract on his part to be performed or observed or persists in any of the above-mentioned breaches of the contract for seven days after notice in writing shall have been given to the contractor by the Engineer-in-charge requiring such breach to be remedied or
- (vii) Abandon the work or
- (viii) During the continuance of the contract becomes bankrupt, make any arrangement compromise with his creditors, or permit any execution to be levied or go liquidation whether compulsory or voluntary not being merely a voluntary liquidation for the purpose of amalgamation or reconstruction then in any such

The owner shall have the power to enter upon the works and take possession thereof the materials, temporary works, constructional plant and stores therein and to revoke the contractor's license to use the same and to complete the works by his other contractor or workmen, to relate the same upon any terms to such other person, firm or Nagarpalika as the owner in his absolute discretion may think to employ, and for the purpose aforesaid to use or authorize the use of any Is, temporary works, constructional plant, and stores as aforesaid with making payment or allowance to the contractor for the said materials other than such as may be certified in writing by the Engineer-in-charge to be reasonable and without making payment or allowance to the contractor for the use of said temporary works,

constructional plant and stock or being liable for any loss or damage thereto. If the owner shall be reason of his taking possession of the works or of the work being got completed by other contractor incurred excess expenditure be deducted from any money, which may be due for the work done by the contractor under the contract and paid for. Any deficiency shall forthwith be made good and paid to the owner by contractor and the owner shall have power to sell in such manner and for such price as he may think fit all or any of the constructional plant, materials etc. consist constructed by or belonging to and to recoup and retain the said deficiency or any part thereof out of the proceeds of the sale.

GC.31 CONTRACTOR'S RESPONSIBILITY WITH THE OTHER CONTRACTOR AND AGENCIES

Without repugnance to any other condition, it shall be the responsibility of the contractor executing the work, to work in close co-operation and co-ordination with other contractors or their authorized representatives and the contractor will put a joint scheme with the concurrence of other contractors or their authorized representatives showing the arrangements for carrying his portion of the work to the Engineer-in-charge and get the approval. The Engineer-in-charge before approving the joint scheme will call the parties concerned and modify the scheme if required. No claim will be entertained on account of the above. The contractor shall conform in all respects with the provisions of any statutory regulations, ordinances or by laws of any local or duly constituted authorities or public bodies which may be applicable from time to time to works or any temporary works, The contractors shall keep the owner indemnified against all penalties and liabilities of every kind arising out of non-adherence to such statutes, ordinance, laws, rules, regulations etc.

GC.32 OTHER AGENCIES AT SITE

The contractor shall have to execute the work in such place and condition where other agencies will also be engaged for other works, such as site grading, filling and leveling, electrical and mechanical engineering works, etc. No claim shall be entertained works being executed in the above circumstances.

GC.33 NOTICES

Any notice under this contract may be served on the contractor or his duly authorized representative at the job site or may be served by' registered post direct to the official address of the contractor. Proof of issue of any such notice could be conclusive of the contractor have been duly informed of all contents therein.

GC.34 RIGHTS OF VARIOUS INTERESTS

The owner reserves the right to distribute the work between more than one contractor. Contractor shall co-operate and afford reasonable opportunity to other contractors for access to the works, for the carriage and storage of materials and execution of their works. Whenever department of the owner is done the work or by other contractor employed by the owner is contingent upon work covered by this contract, the respective rights of the various interests shall be determined by the Engineer-in-charge to secure the completion of various portions of the work in general harmony.

GC.35 PRICE ADJUSTMENTS

No adjustment in price shall allow.

GC.36 TERMS OF PAYMENT

The payment of bills shall be made progressively according to the rules and practices followed by the Nagarpalika. The progressive payment unless otherwise provided in the contract agreement or subsequently agreed to by the parties shall be made generally monthly on submission of a bill by the contractor in prescribed form of an amount according to the value of the work performed less the price of materials supplied by owner, aggregate of previous progressive payments and as required by clause GC.37 (Retention of money) herein. All such progressive payments shall regard as payments by way of advance against final payment.

Payment for the work done by the contractor will base on the measurement at various stages of the work, in accordance with the conditions at clause GC-81.

GC.37 RETENTION MONEY

1. Pursuant to clause GC.36 (terms of payment) on at money due to the contractor for work done, Nagarpalika will hold as retention money five (5.00%) percent of the value of work. The retention money will not normally be due for payment until the completion of the entire work & until such period decided by the Chief Officer and a completion certificate issued by the Nagarpalika in pursuant to GC.79 (Completion Certificate) have finally accepted the work. The Contractor is permitted to convert retention money into Bank Guarantee in later stage.

GC.38 PAYMENTS DUE FROM THE CONTRACTOR

All costs, damages or expenses, for which under the contract, contractor is liable to the Nagarpalika, may be deducted by the Nagarpalika from any money due or becoming due to the contractor under the contract or from any other contract with the Nagarpalika or may be recovered by action at law or otherwise from the contractor.

GC.39 CONTINGENT FEE

- (i) The contractor warrants that he has not employed a person to solicit or secure the contract upon any agreement for a commission, percentage, and brokerage contingent fee. Breach of this warranty shall give the Chief Officer the right to cancel the contract or to take any drastic measure as the Nagarpalika may deem fit. The warranty does not apply to commission's payable by the contractor to establish commercial or selling agent for securing business.
- (ii) No officer, employer or agent of the Nagarpalika shall be admitted to any share or part of this contract or to any benefit that may rise there from.

GC.40 BREACH OF CONTRACT BY CONTRACTOR

If the contractor fails to perform the work under the contract with due diligence or shall refuse or neglect to comply with instructions given to him in writing by the Engineer-in-charge in accordance with the contract, or shall contravene the provisions of the contract, the Chief Officer may give notice in writing to the contractor to make good such failure, neglect, or contravention. Should the contractor fail to comply with such written notice within 14 (Fourteen) days of receipt, it shall be lawful for the Nagarpalika, without prejudice to any other rights

the Nagarpalika may have under the contract, to terminate the contract for all or part of the works, and make any other arrangements it shall deem necessary to complete the work outstanding under the contract at the time of termination. In this event the performance Bond shall immediately become due and payable to the Nagarpalika. The value of the work done on the date of termination and not paid for shall be kept as deposit for adjustment of excess expenditure incurred in getting the remaining work completed and the Nagarpalika shall have free use of any works, which the contractor may have at the site at the time of termination of the contract.

GC.41 DEFAULT OF CONTRACTOR

- i) The Chief Officer may upon written notice of default to the contractor terminate the contract circumstances detailed here under:
 - a) If in the opinion of the Chief Officer, the contractor fails to make completion of works within the time specified in the completion schedule or within the period for which the Nagarpalika has granted extension to the contractor.
 - b) If in the opinion of the Chief Officer, the contractor fails to comply with any of the other provisions of this contract.
- ii) In the event, the Nagarpalika terminates the contract in whole or in part as provided in Article GC. 50 (termination of the contract) the Nagarpalika reserve the right to purchase upon such terms and in such manner as it may be deem appropriate, plant similar to one which is not supplied by the contractor and the contractor will be liable to the Nagarpalika for any additional costs for such similar plant and/or for liquidated damages for delay until such time as may be required for the final completion of works.
- iii) If this contract is terminated as provided in this paragraph GC.30 (Power of Entry) (1) the Nagarpalika in addition to any other rights provided in this clause, may require the contractor to transfer title and deliver to the Nagarpalika.
 - (a) Any completed works.
 - (b) Such partially completed information and contract rights as the contractor has specifically produced or acquired for the performance of the contract so terminated.
- iv) In the event, the Nagarpalika does not terminate the contract as provided in the paragraph GC.50 (termination of contract) the contractor shall continue performance of the contract, in which case he shall be liable to the Nagarpalika for liquidated damages for delay until the works are completed and accepted.

GC.42 BANKRUPTCY

If the contractor shall become bankrupt or insolvent or has a receiving order made against him, or compound with his creditors, or being the Nagarpalika commence to be wound up not being a member voluntary winding up for the purpose of amalgamation or reconstruction, or carry on its business under a receiver for the benefit of his creditors or any of them, the Nagarpalika shall be at liberty to either (a) terminate the contract forthwith by giving notice in writing to the contractor or

to the receiver or liquidator or to any person or organization in whom the contract may become vested and to act in the manner provided in Article GC.41 (Default of Contractor) as though the last mentioned notice had been the notice referred to in such article or (b) to give such receiver, liquidator or other persons in whom the contract may become vested the option of carrying out the contract subject to his providing a satisfactory guarantee for the due and faithful, performance of the contract up to an amount to be agreed. In the event that the Nagarpalika terminates the contract in accordance with this article, the performance bond shall immediately become due and payable on demand to Nagarpalika.

GC.43 OWNERSHIP

Works hand over pursuant to the contract shall become the property of the Nagarpalika from whichever is the earlier of the following times, namely

- (a) When the works are completed pursuant to the contract.
- (b) When the contractor has been paid any sum to which he may become entitled in respect thereof pursuant to clause GC.36 (terms of payment).

GC.44 DECLARATION AGAINST WAIVER

The condemnation by the Nagarpalika of any breach or breaches by the contractor or an authorized sub-contractor of any of the stipulations and conditions contained in the contract, shall in no way prejudice or affect or be construed as a waiver of the Nagarpalika's rights, powers and remedies under the contract in respect of any breach or breaches.

GC.45 LAWS GOVERNING THE CONTRACT

This contract shall be construed according to and subject to the laws of India and the State of Gujarat and under the jurisdiction of the courts of Gujarat at UNA.

GC.46 OVER PAYMENT AND UNDERPAYMENT

Whenever any claim for the payment of a sum to the Nagarpalika arises out of or under this contract against the contractor, the same may be deducted by the Nagarpalika from any sum then due or which at any time thereafter may become due to the contractor under this contract and failing that under any other contract with the Nagarpalika or from any sum due to the contractor with the Nagarpalika (which may be available with the Nagarpalika), or from his retention money or he shall pay the claim on demand. The Nagarpalika reserves the right to carry out post payment audit and technical examinations of the final bill including all supporting vouchers, abstracts etc. The Nagarpalika further reserves the right to enforce recovery of any payment when detected, notwithstanding the fact that the amount of the final bill may be included by one of the parties as an item of dispute before an Arbitrator appointed under Article GC.49 (arbitration) of this contract and notwithstanding the fact that the amount of the final bill figures in the arbitration award. If because of such audit and technical examinations any over payment is discovered in respect of any work done by the contractor or alleged to have been done by him under the contract, the Nagarpalika from the contractor as shall recover it prescribed above. If any under payment is discovered by the Nagarpalika, the amount due to the contractor under this contract may be adjusted against any amount then due or which may at any time thereafter become due before payment is made to the contractor.

GC.47 SETTLEMENT OF DISPUTES

Except as otherwise specifically provided in the contract, all disputes concerning questions of fact arising under the contract shall be decided by the Engineer-in-charge subject to a written appeal by the contractor to the Engineer-in-charge and those decisions shall be final and binding on the parties hereto. Any disputes or differences including those considered as such by only one of the parties arising out of or in connection with this contract shall be to the extent possible settled amicably between the parties. If amicable settlement cannot be reached then all disputed issues shall be settled as provided in Article GC-48 (Disputes or differences to be referred to) and Article No. GC. 49 (Arbitration).

GC.48 DISPUTES OF DIFFERENCES TO BE REFERRED TO

If at any time, any question, disputes or differences of any kind whatsoever, shall arise between the Engineer-in-charge and the contractor upon or in relation to or in connection with this contract either party may forthwith give to the other, notice in writing of the existence of such question, dispute or difference as to any decision, opinion, instruction, direction, certificate or evaluation of the Engineer-in-charge. The Chief Officer, Una Nagarpalika, who shall state his decision in writing and give notice of it to the Engineer-in-charge and to the contractor, shall settle the question, dispute or difference. Such decision shall be final and binding upon both parties. The contract and work on contract if not already breached or abandoned shall proceed.

GC.49 ARBITRATION

In case of any dispute, arising during the course of Execution the matter should be referring to Chief Officer who will be sole Arbitrator and whose decisions will be final and binding to the contractor.

GC.50 TERMINATION OF THE CONTRACT

- (i) If the contractor finds it impracticable to continue operation owing to force major reasons or for any reasons beyond his control and/or the Nagarpalika find it impossible to continue operation, then prompt notification in writing shall be given by the party affected to the other.
- (ii) If the delay or difficulties so caused cannot be expected to cease or become avoidable or if operations cannot be resumed within two (2) months then either party shall have the right to terminate the contract upon ten (10) days written notice to the other. In the event of such termination of the contract, payment to the contractor will be made as follows
 - a. The contractor shall be paid for all works approved by the Engineer-in-charge and for any other legitimate expenses due to him.
 - b. If the Nagarpalika terminates the contract owing to Force Major or due to any cause beyond its control, the contractor shall additionally be paid for any work done during the said two (2) months period including any financial commitment made for the proper performance of the contract and which are not reasonably defrayed by payments under (a) above,
 - c. The Nagarpalika shall also release all bonds and guarantees at its disposal except in cases where the total amount of payment made to

the contractor exceeds the final amount due to him in which case the contractor shall refund the excess amount within thirty (30) days after the termination and the Nagarpalika thereafter shall release all bonds and guarantees. Should the contractor fail to refund the amounts received in excess within the said period such amounts shall be deducted from the bonds or guarantees provided.

- iii) On termination of the contract for any cause the contractor shall see the orderly suspension and termination of operations, with due consideration to the interests of the Nagarpalika with respect to completion, safeguarding or storing of materials procured for the performance of the contract and the salvage and resale thereof.

GC.51 SPECIAL RISKS

If during the contract, there shall be an outbreak of war (whether war is declared or not), major epidemic, earthquake or similar occurrence in any part of the world beyond the control of either party to the contract which financially or otherwise materially affects the execution of the contract, the contractor shall unless and until, the contract is terminated under the provisions of this article use his best endeavors to complete the execution of the contract, provided always that the Nagarpalika shall be entitled at any time after the onset of such special risks, to terminate the contract by giving written notice to the contractor and upon such notice being given this contract shall terminate but without prejudice to the rights of either party in respect of any antecedent breach thereof.

The contractor shall not be liable for payment of compensation for delay or for failure to perform the contract for reasons of Force Major. Such as acts of public enemy, acts of Government, fires, floods, cyclones, epidemics, quarantine restrictions, lockouts, strikes, freight embargos and provided that the contractor shall within Ten (10) days from the beginning of such delay notify the Engineer-in-charge in writing, of the cause of delay, the Nagarpalika shall verify the facts and grant such extension as the facts justify.

GC.52 CHANGE IN CONSTITUTION

Where the contractor is a partnership firm, the prior approval in writing of the owner shall be obtained before any change is made in the constitution of the firm. Where the contractor is an individual or undivided family business concern such approval as previously mentioned shall likewise be obtained before the contractor enters into any partnership agreement where under the partnership firm would have the right to carry out the works hereby undertaken by the contractor. If prior approval as previously mentioned is not obtained, the contract shall be deemed to have been assigned in contravention of contract.

GC.53 SUB-CONTRACTUAL RELATIONS

All work performed for the contract by a sub-contractor shall be pursuant to an appropriate agreement between the contractor and the sub-contractor, which shall contain provision to:

- a. Protect and preserve the rights of the Nagarpalika and the Engineer in charge with respect to the works to be performed under the sub-contract so that the sub-contracting party will not prejudice such rights.

- b. Require that such work be performed in accordance with the requirements of contract documents.
- c. Require under such contract to which the contractor is a party, the submission to the contractor of application for payment and claims for additional costs, extension of time, damages for delay or otherwise with portions of the work in sufficient time, that the contractor may apply for payment and comply in accordance with the contract documents for like claims by the contractor upon the Nagarpalika.
- d. Waive all rights the contracting parties may have against one another for damages caused by fire or other perils covered by the property insurance except such rights as they may have to the proceeds of such insurance held by the Nagarpalika as trustee and,
- e. Obligate each sub-contractor specifically to consent to the provisions of this Article.

GC.54 PATENTS AND ROYALTIES

1. Contractor, if licensed under any patent covering equipment, machinery, materials or composition of matter to be used or supplied or methods and process to be practiced or employed in the performance of this contract agrees to pay all royalties and license fees, which may be due with respect thereto. If any equipment, machinery, materials, composition, matters, to be used or supplied or methods practiced or employed in the performance of this contract, is covered by a patent under which contractor is not licensed, then the contractor before supplying using the equipment, machinery, materials, compositions, methods of process shall obtain such license and pay such royalties and license fees as may be necessary for performance of this contract. In the event contractor fails to pay such royalty or to obtain any such license, the contractor at his own expenses will defend any suit for infringement of such patents, which is brought against the contractor or the owner because of such failure, and the contractor will pay any damages and costs awarded in such suit. The contractor shall promptly notify the owner if the contractor has acquired knowledge of any plant under which a suit for infringement could be reasonably brought because of the use by the owner of any equipment machinery, materials, process methods to be supplied in hereunder, Contractor agrees to and does hereby grant to owner together with the right to extend the same to any of the subsidiaries of the owner an irrevocable royalty free license to use in any country, any invention made by the contractor or his employees in or as a result of the performance of work under contract.
2. With respect to any subcontract entered into by contractor pursuant to the provisions of the relevant clause hereof, the contractor shall obtain from the sub-contractor an understanding to provide the owner with the same patent protection that contracts is required to provide under the provisions of the clause.
3. The owner shall indemnify and save harmless the contractor from any loss account of claims against contractor for the contributory infringement of pat rights arising out of and based upon the claim that the use by the Nagarpalika

the process included in the design prepared by the owner and used in the operating of the plant infringes on any patent rights.

GC.55 LIEN

If, at any time, there should be evidence of any lien or claim for which owner might have become liable and which is chargeable to the contractor, the owner shall have the right to retain out of any payment then due or thereafter to become due a amount sufficient to completely indemnify the owner against such lien or claim or such lien or claim be valid the owner may pay and discharge the same and deduct the amount as paid from any money which may be due or become due and payable to the contractor. If any lien or claims remaining unsettled after all payments are made, the contractor shall refund or pay to the owner all money that the latter may be compelled to pay in discharging such lien or claim including all costs and reasonable expenses.

GC.56 EXECUTION OF WORK

The whole work shall be carried out in strict conformity with the provisions of the contract documents, detailed drawings, specifications and the instructions of the Engineer-in-charge from time to time. The contractor shall ensure that the whole work is executed in the most substantial, and proper manner with best workmanship using materials of best quality in strict accordance with the specifications to the entire satisfaction of the Engineer-in-charge.

GC.57 WORK IN MONSOON

When the work continues in monsoon, the contractor shall maintain minimum labor force required for the work and plan and execute the construction and erection work according to the prescribed schedule. No extra rate will be considered for such work in monsoon. During monsoon and entire construction period the contractor shall keep the site free from water at his own cost.

GC.58 WORK ON SUNDAYS AND HOLIDAYS

No work except curing shall be carried out on Sundays and Holidays. However, if the exigencies of the work need continuation of work on Sundays and Holidays, written permission of the Engineer in-charge shall be obtained in advance.

GC.59 GENERAL CONDITIONS FOR CONSTRUCTION WORK

Working hours shall be eight every day. The overtime work in two shifts could be carried with the written permission of the Engineer-in-charge but no compensation shall be paid for the same. The rate quoted shall include this. The Contractor shall plan his work in such a way that his laborers do not remain idle. The owner will not be responsible for idle labor of the contractor. The contractor shall submit to the owner progress report every week. The details and Performance of the report will be as per mutual agreement.

GC.60 DRAWINGS TO BE SUPPLIED BY THE OWNER

The drawings attached with the tender documents shall be for general guidance of the Contractor to enable him to visualize the type of work contemplated and scope of work involved. Details working drawings according to which the work is to be done shall be furnished from time to time as the work progresses. The contractor shall study the drawings thoroughly in connection with details and bring to the

notice of the Engineer-in-charge discrepancy if any, before actually carrying out the work.

GC.61 DRAWINGS TO BE SUPPLIED BY THE CONTRACTOR

Where drawings, data are to be furnished by the contractor they shall be as enumerated in special conditions of contract and shall be furnished within the specified time. Where approval of drawings has been specified it shall be the contractor's responsibility to have, these drawings were approved before any work is taken up with regard to the same. Any changes becoming necessary in those drawings during the execution of the work shall have to be carried out by the contractor at no extra cost. All final drawings shall bear the certification stamp as indicated below duly signed by both the contractor and Engineer-in-charge.

"Certified true for

.....Project.

Agreement No

Signed

Contractor

Engineer-in-charge

Drawings will be approved within three (3) weeks of the receipt Engineer-in-charge.

GC.62 SETTING OUT WORK

The Contractor shall set out the work on the site handed over by the Engineer-in-charge and shall be responsible for the correctness of the same. The work shall be carried out to the entire satisfaction of Engineer-in-charge. The approval thereof or partaking by Engineer-in-charge in setting out work shall not relieve contractor of any of his responsibilities. The contractor shall provide at his cost all necessary level posts, pegs, bamboos, flags, ranging rods, strings and other materials and laborers required for proper setting out of the work. The contractor shall provide fix and be responsible for the maintenance of all stakes, templates, level markets, profiles and similar other things and shall take all necessary precautions to prevent their removal or disturbance and shall be responsible for the consequences for such removal or disturbance. The contractor shall also be responsible for the maintenance of all existing survey marks, boundary marks, and distance marks and centerline marks either existing or face lines or cross lines shall be marked by small masonry pillars. Each pillar shall have distance mark at the center for setting up the theodolite. The work shall not be started unless the setting out is chocked and approved by Engineer-in-charge in writing but such approval shall not relieve the contractor of his responsibilities about the correctness of setting out. The contractor shall provide all materials, labor and other facilities necessary for checking at his own cost. The contractor shall protect pillars boring geodetic marks on site. On completion of the work, the contractor shall submit the geodetic documents according to which the work has been carried out.

GC.63 RESPONSIBILITIES OF CONTRACTOR FOR CORRECTNESS OF WORK

The contractor shall be entirely and exclusively responsible for the correctness of every part of the work and shall rectify completely any errors therein at his own cost when so instructed by Engineer-in-charge. If any error has crept in the work due to

non-observance of this clause, the contractor will be responsible for the error and bear the cost of corrective work.

1. Material to be supplied by the contractor

Contractor shall procure and provide all the material required for the execution and maintenance of work including M.S. rods; all tools, tackles, construction plant and equipment except, the materials to be supplied by the owner detailed in the contract documents. Owner shall make recommendations for procurement of materials to the respective authorities if desired by the contractor but assumes no responsibility of any nature. Owner shall insist for procurement of materials with ISI marks supplied by reputed firms of the DGS & D list.

2. If however, the Engineer-in-charge feels that the work is likely to be delayed due to contractor's inability to procure materials, the Engineer-in-charge shall have the right to procure materials from the market and the contractor will accept these materials at the rates decided by Engineer-in-charge.

GC.64 MATERIALS TO BE SUPPLIED BY THE OWNER

1. If the contract provided certain materials or stores to be supplied by the owner, such materials and stores transported by the contractor at his cost from owner's stores or Railway Station. The cost from contractor for the value of materials supplied by the owner will be recovered from the R.A. bill based on actual consumption of materials in the work covered and for which R.A. bill has been prepared. After completion of the work, the contractor has to account for the full quantity of materials supplied to him.
2. The value of store materials supplied by the owner to the contractor shall be charged at rates shown in the contract documents and in case the owner supplies any other material not listed in the schedule of materials, the same shall be charged at cost price including carting and other expenses incurred in procuring the same. All materials so supplied shall remain the property of the owner and shall not be removed from the site on any account. Any material remaining unused at the time of completion of work or termination of contract shall be returned to owner's store or any other place as directed by the Engineer-in-charge in perfectly good condition at contractor's cost. When materials are supplied free of cost for use in work and surplus and unaccounted balances thereof are not returned to the owner, recovery in respect of such balance will be affected at double the applicable issue rate of the material or the market rates whichever is higher.

GC.65 CONDITIONS OF ISSUE OF MATERIALS BY THE OWNER

- a. The owner at his store shall issue the materials specified to be issued by the owner to the contractor and all expenses for it carting site shall be borne by the contractor will be issued during working hours and as per rules of owner from time to time.
- b. Contractor shall bear all expenses for storage and safe custody at site of materials issued to him before use in work.
- c. The owner in standard/non-standard sizes as obtained shall issue material from manufacturer.

- d. Contractor shall construct suitable godown at site for storing the materials to protect the same from damage due to rain, dampness, fire, theft etc.
- e. The contractor should take the delivery of the materials issued by the owner after satisfying him that they are in good conditions. Once the materials are issued, it will be the responsibility of the contractor to keep them in good condition and in safe custody. If the materials are damaged or if they are stolen, it shall be the responsibility of the contractors to replace them at his cost according to the instructions of the Engineer-in-charge.
- f. For delay in supply or for non-supply of materials to be supplied by the owner, because of natural calamities, act of enemies, other difficulties beyond the control of the owner, the owner carries no responsibilities. In no case the contractor shall be entitled to claim any compensation for loss suffered by him on this account.
- g. The contractor for manufacturing items, which can be obtained from the manufacturers, shall use none of the materials issued to the contractor. The materials issued by the owner shall be used for the work only and no other purpose.
- h. Contractor shall be required to execute indemnity bond in the prescribed form for the safe custody and account of materials issued by the owner.
- i. Contractor shall furnish sufficiently in advance a statement of his requirements of quantities of materials to be supplied by the owner and the time when the same will be required for the work, to enable Engineer-in-charge to arrange to procure and supply the materials.
- j. A daily account of materials issued by the owner shall be maintained by the contractor showing receipt, consumption and balance on hand in the form laid down by Engineer-in-charge with all connected paper and shall be always available for inspection in the site office.
- k. Contractor shall see that only the required quantities of materials are got issued and no more. The contractor shall be responsible to return the surplus materials at owner's store at his own cost.

GC.66 MATERIALS PROCURED WITH ASSISTANCE OF THE OWNER

Notwithstanding anything contained to the contrary in any of the clauses of this contract, where any materials for the execution of the contract are procured with the assistance of the owner either by issue from owners stock or purchase made under orders or permits or licenses issued materials as trustees for owner, and use such materials not dispose them off without the permission of owner and unserviceable materials that may be left with him after completion of the contract or at its termination for any reason whatsoever on his being paid or credited such price as Engineer-in-charge shall determine having due regard to the conditions of the materials. The price allowed to contractor shall not exceed the amount charged to him excluding the storage charges if any. The decision of Engineer-in-charge shall be final and conclusive in such matters. In the event of breach of the aforesaid condition, the contractor shall in terms of license or permits and/or for criminal breach of trust be liable to compensate owner at double the rate or any higher rates. In the event of these materials at that time, having higher rate or not being

available in the market than any other rate to be determined by the Engineer-in-charge at his decision shall be final and conclusive.

GC.67 MATERIALS OBTAINED FROM DISMANTLING

If the contractor, in the course of execution of work, is called upon to dismantle any part of work for reasons other than because of bad or imperfect work, the materials obtained from dismantling will be the property of the owner and will be disposed of as per instructions of Engineer-in-charge in the best interest of the owner.

GC.68 ARTICLE OF VALUE OF TREASURE FOUND DURING CONSTRUCTION

All gold, silver and other minerals of any description and all precious stones, coins, treasurers, relics, antiquities and other similar things, which shall be found in, under or upon site, shall be the property of the owner and the contractor shall properly preserve the same to the satisfaction of the Engineer-in-charge and shall hand over the same to the owner.

GC.69 DISCREPANCIES BETWEEN INSTRUCTIONS

If there is any discrepancy between the various stipulations of the contract documents or instructions to the contractor or his authorized representative or if any doubt arises as to the meaning of such stipulation or instructions, the contractor shall immediately refer in writing to the Engineer-in-charge whose decision shall be final and conclusive and no claim for losses caused by such discrepancy shall in any event be admissible.

GC.70 ALTERATIONS IN SPECIFICATIONS AND DESIGNS AND EXTRA WORK

- A) The Consultants / Engineer-in-Charge shall have power to make any alterations in, omission from, addition to, substitutions for, the schedule of rates, the original specifications, drawings, designs, and instructions that may appear to him to be necessary or advisable during the progress of work and the contractor shall be bound to carry out such altered/extra/new items of work in accordance with any instructions which may be given to him in writing signed by Engineer-in-Charge and such alteration omissions, additions or substitutions, shall not invalidate contract and any altered, additional or substituted work shall be carried out by the contractor on the same conditions of contract. Consultant as may be considered just and reasonable by him may extend the time for completion. The rates for such additional altered or substitute work shall be worked out as under:
- a) If the rates for additional, altered or substitutes work are specified in the contract for work, the contractor is bound to carry out such work at the same rates as specified in the contract.
 - b) If the rates for additional, altered or substituted work are not specifically provided in the contracts for the work, the rates will be derived from the rates of similar items of work in the contract work. The opinion of Engineer-in-Charge as to whether the rates can be reasonably so derived the items of contract will be final and binding the contractors;
 - c) If the rates of altered, additional or substitute work cannot be determined as specified in (a) or (b) above, the rate should be paid as

per estimate years S.O.R. of R & B Department / GWSSB or which S.O.R. is used for preparing estimates.

- d) If the rates of altered, additional or substitute work cannot be determined as specified in a) or b) or c) above, the contractor shall within seven days of the receipt of order to carry out the work inform the Consultant / Engineer-in-Charge of the rate which he intends to charge for such work supported by rate analysis and the Consultant / Engineer-in-Charge will determine the rate on the basis of prevailing market rates of materials, labor cost at schedule of labor plus 10.00 % there on as contractor's supervision overheads and profit. The opinion of Consultant/Engineer-in-Charge as to the market rates of materials and the quantity of labor involved per unit of measurement will be final and binding on contractor.
- e) For extra items, percentage above or below on Schedule –B shall be considered.

However, under no circumstances, the contractor suspends work or the plea of non-settlement of items falling under this clause.

GC.71 ACTION WHEN NO SPECIFICATIONS IS ISSUED

In case of any class of work for which no specification is supplied by the owner in the tender documents, such work shall be carried out in accordance with relevant latest ISS and if ISS do not cover the same, the work shall be carried out as per general technical specification for building work; and if not covered in then it is to be with standard Engineering practice subject to the approval of Engineer-in-charge.

GC.72 ABNORMAL RATES

Contractor is expected to quote rate for each item after careful analysis of cost involved for the performance of the completed item considering all specifications and conditions of contract.

GC.73 ASSISTANCE TO ENGINEER-IN-CHARGE

Contractor shall make available to Engineer-in-charge free of cost all necessary instruments and assistance in checking of any work made by the contractor setting out for taking measurement of work etc.

GC.74 TESTS FOR QUALITY OF WORK

1. The contractor shall be required to give satisfactory hydraulic test wherever required and shall rectify the defects, if any free of cost. The necessary water, power, labor, etc. required for the contractor at his own cost shall also arrange the hydraulic test.
2. All workmanship shall be of the best kind described in the contract documents and in accordance with the instructions of Engineer-in-charge and shall be subjected from time to time to such tests at contractor cost as the Engineer-in-charge may direct at the place of manufacture of fabrication or on the site or at any such place. Contractor shall provide assistance, instruments, labor, and materials as are normally required for examining, measuring and testing of any work or workmanship as may be selected and required by Engineer-in-charge.

3. All tests necessary in connection with the execution of work as decided by Engineer-in-charge shall be carried out at an approved laboratory at contractor's cost.
4. Contractor shall furnish the Engineer-in-charge for approval when requested or if required by the specification, adequate samples of all materials and finished goods to be used in work sufficiently in advance to permit tests and examination thereof. All materials furnished and finished goods applied in work shall be exactly as per the approved samples.

GC.75 ACTION AND COMPENSATION IN CASE OF BAD WORKMANSHIP

If it shall appear to the Engineer-in-charge that any work has been executed with materials of inferior description, or quality or are unsound or with unsound, imperfect or unskilled workmanship or otherwise not in accordance with the contract, the contractor shall, on demand in writing from Engineer-in-charge or his authorized representative specifying the work, materials or articles complained of, notwithstanding that the same may have been inadvertently passed, certified and paid for, forthwith rectify or remove and reconstruct the work, so specified. In the event of failure to do so within a period to be specified by the Engineer-in-charge in his aforesaid demand, contractor shall be liable to pay compensation at the rate of half a percent of the estimated cost of work for every work limited to a maximum of ten (10%) percent of the value of work while his failure to do so continues and in the case of any such failure the Engineer-in-charge may on expiry of the notice period rectify and remove and re execute the work or remove and replace with others at the risk and cost of the contractor. The decision of the Engineer-in-charge as to any question arising under this clause shall be final and conclusive.

GC.76 SUSPENSION WORK

Contractor shall, if ordered in writing by Engineer-in-charge or his representative temporarily suspended the work or any part thereof for such time (not exceeding Two month) as ordered and shall not after receiving such written notice proceed with the work until he shall have received a written order to proceed therewith. The contractor shall not be entitled to claim compensation for any loss or damage sustained by him because of temporary suspension of work as previously mentioned. An extension of time for completion of work will be granted to the contractor corresponding to the delay caused by such suspension of work if he applies for the same provided the suspension was not consequent upon any default or failure on the part of the contractor.

GC.77 OWNER MAY DO PART OF THE WORK

When the contractor fails to comply with any instructions given in accordance with the provisions of this contract, the owner has the right to carry out such parts of work as the owner may designate whether by purchasing materials and engaging labor or by the agency of another contractor. In such case the owner shall deduct from the amount which otherwise might become due to contractor, the cost of such work and materials with ten (10) percent added to cover all departmental charges and should the total amount thereof exceed the amount due to contract, contractor shall pay the difference to owner.

GC.78 POSSESSION PRIOR TO COMPLETION

The Engineer-in-charge shall have the right to take possession of or to use any completed or partly completed work or part of work. Such possession or use shall not be deemed an acceptance of any work completed in accordance with the contract. If such prior possession or use by Engineer-in-charge delays the process of work, equitable adjustment in the time of completion will be made and the contract shall be deemed to be modified accordingly.

GC.79 COMPLETION CERTIFICATE

As soon as the work has been completed in accordance with contract (except in minor respects that do not affect their use for the purpose for which they are intended and except for maintenance thereof) as per general conditions of contract the Engineer-in-Charge shall issue a certificate (hereinafter called Completion Certificate) in which shall certify the date on which work has been completed and has passed the said tests and owner shall be deemed to have taken over work on the date so certified. If work has been divided in various groups in contract, owner shall be entitled to take over any group or groups before the other or others and there upon the Engineer-in-charge will issue a completion certificate, which will, however, be for such group or groups so taken over only.

In order that contractor could get a completion certificate, he shall make good, with all speed any defect arising from the defective materials supplied by contractor or workmanship or any act or omission of contractor that may have been discovered or developed after the work or groups of works has been taken over. The period allowed for carrying out such work will be normally, Two month. If any defect were not remedied within the time, specified, owner may proceed to do work at contractor's risk and expenses and deduct from the final bill such amount as may be decided by owner. If by reason of any default on the part of the contractor, a completion certificate has not been issued in respect of every portion of work within Two month after the date fixed by contract for completion of work, owner shall be at liberty to use work or any portion thereof in respect of which a completion certificate has been issued, provided that work or the portion thereof so used as aforesaid shall be afforded reasonable opportunity for completion of that work or the portion thereof so used as aforesaid shall be afforded reasonable opportunity for completion of that work for the issue of completion certificate.

GC.80 SCHEDULE OF RATES

1. The rates quoted by the contractor shall remain firm till the completion of the work and shall not be subject to escalation. Schedule of rates shall be deemed to include and cover all costs, expenses and liabilities of every description and all risks or every kind to be taken in executing, completing and handing over the work to owner by contractor. The contractor shall be deemed to have known the nature, scope magnitude and the extent of work and materials required though contract documents may not fully and precisely furnish them. He shall make such provision in the schedule of rates as he may consider necessary to cover the cost of such items of work and materials as may be reasonable and necessary to complete work. The opinion of Engineer-in-charge as to the item of work which are necessary and reasonable for completion of work shall be final and binding on contractor although the same

may be not shown on drawings or described specifically in contract documents.

2. The schedule of rates shall be deemed to include and cover the cost of all constructional plant, temporary work, materials, labor and all other matters in connection with each item in schedule of rates and the execution of work or any portion thereof finished complete in every respect and maintained as shown or described in the contract document or as may be ordered in writing during the continuance of the contract.
3. The schedule of rates shall be deemed to include and cover the cost of all royalties and fees for the articles and processes, protected by letters patent or otherwise incorporated in or used in connection with work, also all royalties, rents and other payments in connection with obtaining materials of whatsoever kind for work and shall include an indemnity to owner which contractor hereby gives against all actions, proceedings, claims, damages, costs and expenses arising from the in Nagarpalika in or use on the works of any such articles, processes or materials. Octroi or other or local board charges if levied a material, equipment or machineries to be brought to site for use on work shall be borne by the contractor.
4. No exemption or reduction of custom duties, excise duties, sales tax or any other taxes or charges of the central or state Government or of any local body whatsoever will be granted or obtained and all such expenses shall be deemed to have been included in and covered by schedule of rates. Contractor shall also obtain and pay for all permits or other privileges necessary to complete the work.
5. The schedule of rates shall be deemed to include and cover risks because of delay and interference with contractor's conduct of work, which may occur from any cause including orders of owner in the exercise of his powers and because of extension of time granted due to various reasons.
6. For work under unit rate basis no alteration will be allowed in the schedule of rates by reasons of work or any part of them being modified, altered, extended, diminished or omitted.

GC.81 PROCEDURE FOR MEASUREMENT OF WORK IN PROGRESS

1. As this being a lump sum contract, no detail measurements are required to taken but the progress of work will be recorded on Item basis as prescribed in Schedule – B.
2. Contractor will submit a bill in approved Performa in quadruplicate to the Engineer-in-charge of the work giving abstract and detailed measurements of various items executed during a month as mutually agreed. The Engineer-in-charge shall verify the bill and the claim, as far as admissible, adjusted if possible, within 10 days of presentation of the bills.

GC.82 RUNNING ACCOUNT PAYMENTS TO BE REGARDED AS ADVANCES

1. All running account payments shall be regarded as payments by way of advance against the final payment only and not as payment for work actually done and completed and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be removed and taken away and reconstructed

or rejected or to be considered as an admission of the due performance of contract or any part thereof.

2. Five (5) percent of the gross R.A. bill amount shall be retained from each bill as retention amount and the same will be paid with the final bill.

GC.83. NOTICE FOR CLAIM FOR ADDITIONAL PAYMENT

If the contractor considers that he is entitled to extra payment or compensation or any claim whatsoever in respect of work, he shall forthwith give notice in writing to the Engineer-in-charge about his extra payment and/or compensation. Such notice shall be given to the Engineer-in-charge within ten (10 days) from the happen of any event upon which contractor basis such claims & such notice shall contain full particulars of the nature of such claim with full details and amount claimed. Failure on the part of the contractor to put forward any claim with the necessary particulars as above, within the time above specified shall be an absolute waiver thereof. No omission by owner to reject any such claim and no delay in dealing therewith shall be waiver by owner or any rights in respect thereof.

GC.84 PAYMENT OF CONTRACTOR'S BILL

1. The price to be paid by the owner to contractor for the work to be done and for the performance of all the obligations undertaken by the contractor under contract shall be based on the contract price and payment to be made accordingly for the work actually executed and approved by the Engineer-in-charge.
2. No payment shall be made for work costing less than Rs. 10,000/- till the work is completed and a certificate of completion given. However, in case of work estimated to cost more than Rs. 10,000/-. Contractor on submitting the bill thereof will be entitled to receive a monthly payment proportionate to the part thereof, approved and passed by Engineer-in-charge, whose certificate of such approval and passing of the sum so payable shall be final and conclusive against contractor. This payment shall be made after necessary deductions as stipulated elsewhere in the contract documents for materials, security-deposit etc. The payment shall be released to the contractor within fifteen (15) days of submission of the bill duly pre-occupied on proper revenue stamp. The owner shall make payment due to contractor by crossed account payee cheque in Indian Currency forwarding the same to the registered office of the contractor. Owner shall not be responsible if the cheque is mislaid or misappropriated by authorized persons.

GC.85 FINAL BILL

Contractor shall submit the final bill within one (1) month of the date of physical completion of work; otherwise, the Engineer-in-charge's certificate of the measurement and of total amount payable for work shall be final and binding on all parties.

GC.86 RECEIPT FOR PAYMENT

Receipt for payment made on account of work when executed by a firm must be signed by a person holding power of attorney in this respect on behalf of contractor except when described in the tender as a limited company in which case the receipt

must be signed in the name of the company by one of its principal officers or by some other person having authority to give effectual receipt for the company.

GC.87 COMPLETION CERTIFICATE

1. When the contractor fulfils his obligation as per terms of contract, he shall be eligible to apply for completion certificate. Contractor may apply for separate completion certificate in respect of each such portion of work by submitting the completion documents along with such application for completion certificate.

The Engineer-in-charge shall normally issue to contractor the completion certificate within one (1) month after receiving an application thereof from contractor after verifying, from the completion documents and satisfying himself, that work has been completed in accordance with and as set out in the construction and erection drawings and the contract documents. Contractor after obtaining the completion certificate is eligible to present the final bill for work executed by him under the terms of contract.

2. Within Two month of completion of work in all respects contractor shall be furnished with a certificate by the Engineer-in-charge of such completion but no certificate shall be given nor shall work be deemed to have been executed until all (i) scaffolding, surplus materials and rubbish is cleared off site completely, (ii) until work shall have been measured by the Engineer-in-charge whose measurement shall be binding and conclusive and (iii) until all the temporary works, labor and staff colonies etc. constructed are removed and the work site cleaned to the satisfaction of the Engineer-in-charge. If contractor shall fail to comply with the requirements as previously mentioned or before date fixed for the completion of work, the Engineer-in-charge may at the expense of contractor remove such scaffolding, surplus materials, rubbish, and dispose of the same as he thinks fit.
3. The following documents will form the completion documents:
 - a) Technical documents according to which the work has been carried out.
 - b) Three sets of construction drawings showing therein the modifications and corrections made during the course of execution signed by the Engineer-in-charge.
 - c) Completion certificate for 'Embedded' or 'Covered' up work.
 - d) Certificate of final levels as set out for various works.
 - e) Certificate of test performed for various work.
 - f) Material appropriation statement for the materials issued by owner for work and list of surplus materials returned to owner's store duly supported by necessary documents.
4. Upon expiry of the period of defect liability and subject to Engineer-in-charge being satisfied that work has been duly maintained by contractor during the defects liability period as fixed originally or as extended subsequently and that contractor has in all respects made up any subsidence and performed all his obligations under contract, the Engineer-in-charge shall (without prejudice to the rights of owner in any way) give final certificate to that effect. The

contractor shall not be considered to have fulfilled the whole of his obligation until the Engineer-in-charge shall have given final certificate.

5. Final certificate only evidence of completion

Except the final certificate, no other certificate of payment against a certificate or on general account shall be taken to be an admission by owner of the due performance of contract or any part thereof or of occupancy or validity or any claim by the contractor.

GC.88 TAXES, DUTIES, OCTROI ETC.

1. Contractor agrees to and does hereby accept full and exclusive liability for the payment of any and all taxes including sale taxes, duties, octroi, etc. now or herein after imposed, increased or modified from time to time in respect of work and materials and all contributions and taxes for unemployment, compensation, insurance and old age pension or annuities now or hereinafter imposed by the Central or State Government authorities with respect to or covered by the wages, salaries or other compensation paid to the persons employed by contractor.

If the contractor is not liable to sale tax assessment, a certificate to that effect from the competent authority shall be produced, without which final payment to the contractor shall not be made. The owner shall supply IP, 'C' and 'D' from, and the contractor shall be required to pay full sales tax as applicable.

2. Contractor shall be responsible for compliance with all obligations and restrictions imposed by the labor law or any other law affecting employer-employee relationship.
3. Contractor further agrees to comply and to secure the compliance of all subcontractors with applicable central state, and local laws and regulations and requirement. Contractor also agrees to defend, indemnify and hold harmless the owner from any liability or penalty which may be imposed by central, state or local authority by reasons of any violation by contractor or subcontractor of such laws; regulations or requirements and also from all claims, suits or proceedings that may be brought against owner arising under, growing out of or by reasons or work provided for by this contract by third parties or by Central or State Government Authority or any Administrative Sub-Division thereof.

The Sales Tax on work contract will be borne by contractor.

GC.89 INSURANCE

Contractor shall at his own expenses carry and maintain with reputable Insurance Companies to the satisfaction of owner as follows:

1. Contractor agrees to and uses hereby accept full and exclusive liability for compliance with all obligations impose by the Employee's State Insurance Act 1948, and Contractor further agrees to defend, indemnify and hold owner hardness from any liability or penalty which may be imposed by the central or state government or local authority by reasons of any assorted violation by Contractor or sub-Contractor or the Employees, State Insurance Act 1948 and

also from all claims, suits or proceedings that may be brought against owner arising under, growing out of or by reasons of the work provided for by this contract whether brought by employees of contractor, by third parties or by Central or State Government authority or any administrative sub division thereof.

Contractor agrees to fill in with the Employees State Insurance Nagarpalika, the declaration form and all forms which may be required in respect of contractor's or sub-contractor's employees whose aggregate remuneration is Rs. 400/- p.m. or less and who are employed in work provided for or those covered by ESI from time to time under the agreement. The Contractor shall deduct and secure the agreement of the sub contractor to deduct the employee's contribution as per the first schedule of the Employees State Insurance Act from wages. Contractor shall remit and secure the agreement of sub-contractor to remit to the State Bank of India Employees State Insurance Nagarpalika Accounts, the employee's contribution as required by the act. Contractor agrees to maintain all cards and records as required under the Act in respect of employees and payments and contractor shall secure the agreements of the sub contractors to maintain in such records, any expenses incurred for the contributions, making contributions or maintaining records shall be to contractors or sub-contractors own account. Owner shall retain such sum as may be necessary from the contract value until contractor shall furnish satisfactory proof that all contribution as required by the Employees State Insurance Act 1948 has been paid.

2. Workman's compensation and employee's liability insurance: Insurance shall be affected for all contractors' employees engaged in the performance of this contract. If any part of work is sublet, contractor shall require the sub contractor to provide workman's compensation and employer's liability insurance, which may be required by owner.
3. Other Insurance required under law of regulations or by owner, Contractor shall also carry and maintain any and all other insurance, which may be required under any law or regulation from time to time. He shall also carry and maintain any other insurance, which may be required by owner.

GC.90 DAMAGE TO PROPERTY

1. Contractor shall be responsible for making good to the satisfaction of owner any loss of and any damage to all structures and properties belonging to owner or being executed or procured or being procured by owner or of other agencies within the premises of all work of owner, if such loss or damage is due to fault and / or the negligence of willful act or omission of contractor, his employees, agent, representatives or subcontractors.
2. Contractor shall indemnify and keep owner harmless of all claims for damage to properties other than property arising under by reasons of this agreement, such claims result from the fault and / or negligence or willful act or omission of contractor, his employees, agents, representative or sub contractors.

GC.91 CONTRACTOR TO INDEMNIFY OWNER

The contractor shall indemnify and keep indemnified the owner and every member, officer and employee of owner from and against all actions, claims, demands and liabilities whatsoever under the in respect of the breach of any of the above clauses and / or against any claim, action or demand by any workman / employee of the contractor or any sub contractor under any laws rules or regulations having force of laws, including but not limited to claims against the owner under the workman compensation Act 1923, the employees Provident Funds Act 1952 and / or the contract labor (Abolition and Regulations) Act 1970.

GC.92 PAYMENTS OF CLAIMS AND DAMAGES

1. If owner has to pay any money in respect of such claims or demands aforesaid, the amount so paid and the cost incurred by the owner shall be charged to and paid by contractor without any dispute notwithstanding the same may have been paid without the consent or authority of the contractor.
2. In every case in which by virtue of any provision applicable in the workman's Compensation Act 1923 or any other Act, owner be obliged to pay compensation to workmen employed by contractor the amount of compensation so paid, and without prejudice to the rights of owner under sec. (12) sub section (2) of the said Act, owner shall be at liberty to recover such amount from any surplus due to or to become due to the contractor or from the security deposit. Owner will not be bound to contest any claim made under section (12) subsection (12) of the said act except on written request of contractor and giving full security for all cost's consequent upon the contesting of such claim.

The contractor shall protect adjoining sites against structural, decorative and other damages that could be caused to adjoining premises by the execution of these works and made goods at his cost, any such damage, so caused.

GC.93 IMPLEMENTATION OF APPRENTICE ACT 1954

Contractor shall comply with the provisions of the apprentice Act 1954 and the orders issued there under from time to time. If he fails to do so, it will be a breach of contract.

GC.94 HEALTH AND SANITARY ARRANGEMENTS FOR WORKERS

Contractor shall comply with all the rules and regulations of the local sanitary authorities or as framed by owner from time to time for the protection of health and provide sanitary arrangements of all labor directly or indirectly employed on the work of this contract.

GC.95 SAFETY CODE

GENERAL

Contractor shall adhere to safe construction practice and guard against hazardous and unsafe working conditions and shall comply with owner's rules as set forth herein.

1. First Aid and Industrial Injuries

- 1.1 Contractor shall maintain first aid facilities for its employees and those of his sub-contractors.
- 1.2 Contractor shall make outside arrangements for ambulance service and for the treatment of industrial injuries. Name of those providing these services shall be furnished to Engineer-in-charge, prior to start of construction, and their telephone numbers shall be prominently posted in contractor's field office.
- 1.3 All injuries shall be reported promptly to Engineer-in-charge and a copy of Contractor's report covering each personal injury requiring the attention of a physician shall be furnished to owner.

2. General Rules

2.1 Carrying and striking, matches, lighters inside the project area and smoking within the job site are strictly prohibited. Violators of smoking rules shall be discharged immediately. Within the operation area, no hot work shall be permitted, without valid gas, safety, fire permits. The contractor shall also be held liable and responsible for all lapses of his sub-contractors/employees in this regard.

3. Contractor's Barricades

- 3.1 Contractor shall erect and maintain barricades without any extra cost, required in connection with his operation to guard or protect during the entire phase of the operation of this contract for,
 - i) Excavation
 - ii) Hoisting areas
 - iii) Areas adjudged hazardous by Contractor's or Owner's inspectors.
 - iv) Owner's existing property liable to be damaged by Contractor's operations, in the opinion of Engineer-in-charge/Site Engineer.
 - v) Railroad unloading spots.

Contractor's employees and those of his subcontractors shall become acquainted with owner's barricading practices and shall respect the provisions thereof.

Barricades and hazardous areas adjacent to but not located in normal routes of travel shall be marked by red lantern at night.

4. Scaffolding

Suitable scaffolding shall be provided for workman for all works that cannot safely be done from ladders. When a ladder is used, an extra man shall be engaged for holding the ladder and if the ladder is used for carrying materials as well suitable footholds and handholds shall be provided on the ladder and the same shall be given an inclination not steeper than 1 in 4 (1 horizontal and 4 vertical).

Scaffolding or staging, more than 3.6 M (12') above the ground or floor, swing or suspended from an overhead support or erected with stationary support shall have a guard rail properly attached, bolted, braced and otherwise fixed at least 1.0 M (3') high above the floor or

platform or scaffolding or staging and extending along the entire length of the outside ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.

Working platforms, gangways, and stairways should be so constructed that they should not sag unduly or inadequately and if the height of the platform or the gangway of the stairway is more than 3.6 M. (12'0") above ground level or floor level, they should be closely boarded, should have adequate width and should be suitably fastened as described in 4.2 above.

Every opening in the floor of a building or in a working platform be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 1.0 M (3' 0").

Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9.0 M (30') in length while the width between the side rails in rung ladder shall in no case be less than 30 cms (12 inches) for ladder up to and including 3.0M (10'); in longer ladders this width would be increased at least 6MM (1/4") for each additional 30 cm (1.0) of length. Uniform step spacing shall not exceed 30 CM. (12") adequate precaution shall be taken to prevent danger from electrical equipment. No materials on any of the side of work shall be so stacked or placed as to cause danger or inconvenience to any person or public. The contractor shall also provide all necessary fencing and lights to protect the workers and staff from accidents, and shall be bound to bear the expenses of defense of every suit, action or other proceedings at law that may be brought by any persons for injury sustained owing to neglect of the above precautions and to pay damages and costs which may be awarded in any such suit or action or proceedings to any such person, or which, may be with the consent of the contractor be paid to compromise any claim by any such person.

5. Excavation

- 5.1 All trenches 1.2 M (4') or more in depth shall at all time are supplied with at least one ladder.
- 5.2 Ladder shall be extended from bottom of the trench to at least 3" above the surface of the ground. The sides of the trench, which are 1.5 M (5') or more in depth shall be stopped back to give suitable slope, or securely held by timber bracing, to avoid the danger of sides to collapse. The excavated materials shall not be placed within 1.5 M (5') of the trench or half of the trench depth whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or under cutting be done.

6. Demolition

Before any demolition, work is commenced and during the progress of the work, all roads and open area adjacent to the work site shall either be closed or suitably protected.

No electric cable or apparatus, which is liable to be a source of danger, shall remain electricity charged.

All practical steps shall be taken to prevent danger to persons employed from risk of fire or explosion or flooding. No floor or other part of the building shall be so over loaded with debris or materials as to render it unsafe.

7.0 Safety equipment

7.1 All necessary personal safety equipment as considered necessary by the Engineer-in-charge should be made available for the use of persons employed on the site and maintained in a condition suitable for immediate use, and the contractor should take adequate steps to ensure proper use of equipment by those concerned.

7.2 Workers employed on mixing asphalt materials, cement and lime mortars shall be provided with protective footwear and protective gloves.

8.0 Risky places

8.1 When the work is done near any place where there is a risk of drowning, all necessary safety equipment shall be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision should be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.

Hoisting equipment

Use of hoisting machines and tackles including their attachments, and storage and supports shall conform to the following standards or conditions.

These shall be of good mechanical construction, sound material and adequate strength and free from patent defect and shall be kept in good condition and in good working order.

Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength and free from patent defects.

Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years should be in charge of any hoisting machine including any scaffolding.

In case of every hoisting machine and of every chain ring hook, shackle, swivel and pulley block used in hoisting or lowering or as means of suspension, the safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with the safe working load and the conditions

under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.

In case of departmental machine, the Engineer-in-charge, As regards contractors' machine, the contractor shall, shall notify the safe workload notify the safe working load of the machine to the Engineer-in-charge. Whenever the contractor brings any machinery to site of work, he should get it verified by the Engineer-in-charge concerned.

10.0 Electrical equipments

10.1 Motors, gears, transmission, electric wiring and other dangerous parts of hoisting appliances shall be provided with efficient safeguards, hoisting appliance should be provided with such means when will reduce to the minimum the risk of accidental descent of the load, adequate precautions shall be taken to reduce to the minimum the risk of any part or a suspended load becoming accidentally displaced. When workers are employed on electrical installations, which are already energized, insulating mats, wearing apparel such as gloves, and boots as may be necessary shall be provided. The workers shall not wear any rings, watches and carry keys or other materials, which are good conductors of electricity.

11.0 Maintenance of Safety devices

11.1 All scaffolds, ladders and other safety devices as mentioned or described herein shall be maintained in sound condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near place of work.

12.0 Display of safety instructions

12.1 These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place at the work spot. The persons responsible for compliance of the safety code shall be named therein by the contractor.

13.0 Enforcement of safety regulations

13.1 To ensure effective enforcement of the rules and regulations relating to safety precautions, the arrangement made by the contractor shall be open to inspection by the welfare officer, Engineer-in-charge or safety Engineer of the owner or their representatives.

14.0 No exemption

14.1 Notwithstanding the above clauses, 1.0 to 13.0 there is nothing to exempt the contractor from the operations of any other act or rules in force in the Republic of India.

14.2 In addition to the above, the contractor shall abide by the safety code provisions as per C.P.W.D. safety code framed from time to time.

GC.96 ACCIDENTS

It shall be the contractor's responsibility to protect against accidents on the works. He shall indemnify the owner against any claim for damage or for injury to person or property resulting from, and in the course of work and under the provision of the workman's compensation Act. On the occurrence of an accident arising out of the works which results in death or which is so serious as to be likely to result in death, the contractor shall within twenty four hours of such accident, report in writing to the Engineer in charge, the facts stating clearly and in sufficient details the works involving injuries to person or damage to property other than that of the contractor shall be promptly reported to the Engineer in charge, stating clearly and in sufficient details the facts and circumstances of the accidents and the action taken. In all cases, the contractor shall indemnify the owner against all loss or damage resulting directly or indirectly from the contractor's failure to report in the manner aforesaid. This includes penalties or fines, if any, payable by the owner as a failure to conform to the provisions of the said act concerning such accidents.

In the event of an accident in respect of which compensation may become payable under the workman's compensation Act VIII of 1923 including all modification thereof, the Engineer-in-charge may retain out of money due and payable to the contractor such sum or sums of money as may in the opinion of the Engineer-in-charge be sufficient to meet such liability. On receipt of award from the labor Chief Officer concerning quantum of compensation, the difference in amount will be adjusted.

GC.97 PRICE VARIATION

- NOT APPLICABLE -

G.C.98

No claim for interest and/or damages shall be entertained for the delay in payment of bills and / or any such dues from the Una Nagarpalika for any reason, whatsoever.

G.C.99 THIRD PARTY INSPECTION

The work being of high importance, the Nagarpalika may at its own discretion decide to appoint an independent agency for third party inspection. In such event, the contractor will be required to coordinate, and work under the guidance of the said agency as well as will have to comply with all the qualitative as well as administrative procedures laid down by the above agency.

Contractor's Signature with address

Place:

Date:

**CHIEF OFFICER
UNA NAGARPALIKA
UNA**

UNA NAGARPALIKA – UNA, DIST. GIR-SOMNATH

Sr. No.	Item Discription	Qty	Unit
1	Box cutting the road surface to proper slope and camber for making a base for road work including removing the excavated stuff and depositing on the road side slope as directed up to 50 M.	1.00	cum
2	Scarifying graveled macadam or bitumen macadam surface 6 cm to 10 cm. depth including stacking useful materials on road side and disposing off remaining stuff.	1.00	Sqm
3	Providing and laying compacted W.B.M. 100 mm. thick of Grading-I B.T. metal of size 40 mm to 63 mm including using 22% Stone screening 13.2 mm size and 7% stone dust as filler including spreading, watering and consolidation by vibratory roller etc. complete	1.00	cum
4	Providing and laying compacted W.B.M. 150 mm. thick of Grading-II B.T. metal of size 40 mm to 63 mm in two layers including using 13% Stone screening 13.2 mm size and 7% stone dust as filler including spreading, watering and consolidation by vibratory roller etc. complete.	1.00	cum
5	Providing, Supplying and laying compacted W.B.M. Grading-II at Potholes B.T. metal of size 40 mm to 63 mm in two layers including using 13% Stone screening 13.2 mm size and 7% stone dust as filler including spreading, watering and consolidation by vibratory roller etc. complete.	1.00	M.T.
6	Providing and laying 75mm thick Built up spray grout in two layers using black crashed stone aggregate as per gradation and specification including using cationic rapid setting emulsion for tack coat at the rate of 4.00 kg./10 Sqm by mechanical sprayer and bitumen of VG-30 grade for mixing at the rate of 19.90kg/ M.T. by weight of total mix (i.e. 1.99%) and mixing the aggregate and bitumen by continuous batching drum mix plant and spreading the same by paver finisher and consolidation by vibrator roller including cost of all materials, fuel, labours, tools and plants, using contractor's own machineries	1.00	M.T
7	Providing and laying 37.5mm thick compacted bitumenous macadam using black crushed stone aggregate and filler material as per gradation of M.O.R.T. & H. specification including using cationic rapid setting emulsion for tack coat at the rate of 2.50 kg/10 sqm., by mechanical sprayer and bitumen of 60-70 grade for mixing at the rate of 34.00Kg/M.T. by weight of total mix (i.e.3.4%) and mixing the aggregate and bitumen by continuous drum mix plant and spreading the same by paver finisher and consolidation by vibratory roller including cost of all materials, fuel, labours, tools and plants, using contractor's own machineries.	1.00	M.T
8	Providing and laying 50mm thick compacted bitumenous macadam using black crushed stone aggregate and filler material as per gradation of M.O.R.T. & H. specification including using cationic rapid setting emulsion for tack coat at the rate of 2.50 kg/10 sqm., by mechanical sprayer and bitumen of 60-70 grade for mixing	1.00	M.T

	at the rate of 34.00Kg/M.T. by weight of total mix (i.e.3.4%) and mixing the aggregate and bitumen by continuous drum mix plant and spreading the same by paver finisher and consolidation by vibratory roller including cost of all materials, fuel, labours, tools and plants, using contractor's own machineries.		
9	Providing and laying 25mm thick semi dense bitumenous concrete using black crushed stone aggregate and filler materials as per gradation of M.O.R.T & H. specification including using bitumen of 60-70 grade of mixing at the rate of 50.00 Kg/M.T. by weight of total mix (i.e. 5.00%) and mixing the aggregate and bitumen by continuous drum mix plant and spreading the same by paver finisher and consolidation by vibratory roller including cost of all materials, fuel, labours, tools and plants, using contractor's own machineries.	1.00	M.T
10	Providing and laying asphalt painting (VG-30 grade) on B.T surface using bulk asphalt @ 5.00 kg/10 sqm & spreading stone dust @0.03 cum/10 sqm on painted surface including cost of asphalt & stone dust & all labour work incl. rolling with PTR roller etc complete.	1.00	Sqm
11	Road Marking with hot applied thermoplastic paints with reflectorising glass beads on bitumen surface providing and laying a hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250gms per sqm are, thickness of 2.5mm is excluding of surface applied glass beds as per IRC:35-2015. The finished surface to be level, uniform and free from streaks and holes. zebra patta/ bump patta line/ center line/ edge line/ cut patta. The white color marking should provide; iminace coefficient on comend road shall be min 130 mcd/m2/lux during the service life during the day time. The marking should meet the performance criteria for night time reflectively, wet reflectivity and skid resistance as mentioned in the section-15 if IRC 35-2015. Warranty For the retro reflective should be two years	1.00	Sqm
12	Cat Eye / Road Stud / RPM; Supplying raised pavement Marker made of polycarbonate and ABS molded body and reflective panels with micro prismatic lens (No Glass Bead Lens) capable of providing total internal reflection of the light entering the lens face and shall support a load of 13635 kgs. tested in accordance to ASTM M 4280 type h and complying to specification of category A of MORTH circular No RW/NH/33023/10-97 D DO III dt 11.06.1997. The height, width and length shall not exceed 20 mm,130 mm and 130 mm and with the slop to the base shall be 35 +/-5 degree. The body of the marker should having finger grip for easy and accurate placement and application with epoxy / bituminous adhesive as recommended by the manufacturer of the marker. The color of the marker should be as per the IRC 35-2015 and directed by engineer-in-charge.	1.00	Nos.
13	Tracing Of Old Manhole at Every 30 Mt	1.00	Each
14	Modification Of Existing House Connection Chambers, Risen up to 23cm. Average of 0.23m Wide R.C.C. Coping with inside 15mm Thick Cement Plaster, Curing And Dismantling Existing Chamber's Precast cement frame and Cover and Also Fitting The Coping Work as Directed as Required and also refitting of existing house connection chamber's collar and cover as required.	1.00	Each

15	RCC precast M.H. Frame & cover manufacture, supply & Delivery at store or at site of work precast RCC M-200 frame & cover suitable to drainage M.H. and as per type design & Drawing including cost of reinforcement M.S. angle or plate, curing, mold work etc. Heavy Duty frame & cover suitable of 50cm opening of MH	1.00	Each
16	Demolition including stacking of serviceable materials and disposal of unserviceable materials with all lead and lift. (i) R.C.C. Work	1.00	Cum
17	Providing and laying cement concrete 1:3:6 (1-Cement : 3-Coarse Sand : 6-Stone aggregate of 40 mm Nominal size) and curing complete excluding cost of form work in : (a) Foundation and plinth	1.00	Cum
18	Providing and casting in situ ordinary cement concrete M 200 for kerb / kerb blocks including formwork, curing and finishing complete	1.00	m3
19	Providing and fixing pre-cast Rubber Dye / steel Dye inter locking concrete block 60mm thick with grade of concrete M300 pneumatic compressed / vibrated mechanically and as per approved design Confirming to IS 15658: 2006 including 35 mm Sand layer for levelling and filling the joint with sand in proper line and level as per guidelines of IRC : SP 63-2018 etc. Complete.	1.00	Sqm
20	Providing and fixing pre-cast Rubber Dye inter locking concrete block 80mm thick with grade of concrete M300 pneumatic compressed by mechanically pressed and as per approved design including 75mm Sand layer for levelling and filling the joint with sand in proper line and level etc. complete.	1.00	Sqm
21	Refitting of pre-cast Rubber Dye inter locking concrete (Paver Block) including 75mm thick sand layer for levelling and filling the joint with sand in proper line and level etc. complete	1.00	Sqm
22	Providing and casting in situ ordinary cement concrete M-200 for average 100 mm thick wearing coat laid as directed including tamping, vibrating, finishing, curing and filling in joints with bitumen complete.	1.00	Cum

Contractor's signature with address:

Place:

Date:

**CHIEF OFFICER
UNA NAGARPALIKA
UNA**

7. TECHNICAL SPECIFICATIONS

GENERAL:

These specifications cover the items of work in structural and non-structural parts of the works coming under purview of this document. All work shall be carried out in confirmation with these specifications. In general, provisions of Indian Standard, Indian Road Congress codes, MOST specifications, standard specification of Gujarat Govt., and other national standards shall be followed unless otherwise specified. These specifications are not intended to cover the minor details. The work shall be executed in accordance with best modern practices & all latest codes and standards referred to in these specifications and their revisions issued 30 days prior to submission of tender shall be read in conjunction with the various other documents forming the contract viz. Tender specifications, Schedule B, contractor drawings and other related documents.

These specification cover the items of work in structural and non structural parts of the works coming under purview of this document all work

ORDER OF PRECEDENCE

For this document, in case of errors, omissions and / or disagreement between written and scaled dimensions on the drawings or between the drawings and specifications etc. the following order of precedence shall apply:

- a) Between scaled dimensions and written dimensions / description on a drawing the later shall be accepted.
- b) Between the written or shown description / or dimensions in the drawing, and the corresponding one in the specification, the later shall apply.
- c) For execution stage the following order of precedence shall apply.
 - i) Execution drawings / notes / modifications specifically approved for construction.
 - ii) Specific provisions of specifications and conditions of this contract document.
 - iii) In the absence of above, standard specifications of PWD and good engineering practices in that order.
 - iv) In case of conflicting provisions of IS specifications and IRC specifications, former shall prevail, i.e. IS specifications would have precedence over IRC specifications unless tender provisions are specific for the particular item of work.
 - v) However, notwithstanding anything said above, the interpretation/ decision of the Municipal Commissioner / Engineer-in-charge shall be final and binding.

1. Inclusive documents

The provisions of all conditions of contract, those specified in this tender as well as execution drawings, and notes or other specifications issued in writing by the Engineer-in-charge shall form part of these specifications.

2. Order of precedence, clarifications and interpretations

When the various specifications and codes referred to in preceding portion are at variance with these specifications and or with each other, the order of precedence will generally be as under;

The attention of the contractor is drawn to those clauses of IS codes which require either supplementing specifications from the Engineer-in-charge or the call for mutual agreement of such specifications between the supplier and purchaser. In such cases, it shall be responsibility of the contractor to seek clarifications on any uncertainty, ambiguity and obtain prior approval of the Engineer-in-charge, before taking up supply/construction etc.

3. Measurement and Payments:

- (a) The methods of measurement and payment shall be as described under various items and in the Schedule B. Where specific definitions are not given, methods described in IS Code will be followed, Should there be any detail of construction of materials which has not been referred to in the specifications or in the Schedule B and drawings but the necessity for which may be implied or inferred there from, or which are usual or essential for the completion of the work in the trades, the same shall be deemed to be included in the rates quoted by the contractor in the Schedule B.

- (b) Unacceptable work

All defective works are liable to be demolished, rebuilt and defective materials replaced by the contractor at his own cost. In the event of such works being accepted by carrying out repairs etc. as specified by the Engineer-in-charge, the cost of repairs will be borne by the contractor and will be paid for the works actually carried out by him at reduced rates of the tendered rates, as may be considered reasonable by the Engineer-in-charge, in the preparation of final or on account bills.

Signature of contractor

Place:

Date:

**CHIEF OFFICER
UNA NAGARPALIKA
UNA**

7.1 GENERAL SPECIFICATION OF MATERIALS

Stone Dust:

Stone dust shall be obtained from the quarries which crust black trap stone only. It shall not contain more than 3% of silt; silt shall be tested by means of measuring cylinder under filed test.

B.T. Chips 25mm Size:

The B.T. Chips shall be obtained by crushing black trap stone only in the mechanical pressure. The black trap stone shall be hard tough durable clean dense close grained and free from soft decayed and weathered portion. It shall be clean and free from earthing from dust, dirt of other objectionable matter. B.T. chips shall be generally satisfying the following requirements as per the Clause No.303-2-2 of M.O.T. specifications and shall comply I.E. 363-1970 in general.

Los Angles abrasion	I.S.2386 Part-IV	35% maximum
Aggregate impact value	-do-	30% maximum
Water absorption	I.S.2368	2% maximum

The B.T. chips shall be roughly cubical in shape and more or less or uniform in size, rounded, flaky thin and elongated pieces shall not be accepted. Before collection sample of B.T. chips shall be got approved for quality, size and shape by the engineer in charge in the laboratory. They shall be completely dry at the time of use.

The B.T. chips shall be obtained by crushing black trap stone only in mechanical crusher. The black trap stone shall be hard, tough, durable, clean, dense, close grained and free from soft decayed and weathered portions. B.T. Chips shall be clean and free from coating of dust of other objectionable matter. B.T. Chips shall generally satisfy the following requirements as per Clause No.503.2.2 or M.O.T. specifications and shall comply I.S.383-1970 in general.

Los Angles abrasion	I.S.2386 Part-IV	30% maximum
Aggregate impact value	-do-	30% maximum
Water absorption	I.S.2368	2% maximum

Grading:

The size of B.T. chips shall be as under:

Wholly passing through Square mesh.	Wholly retained in Square mesh.
20 mm size (About $\frac{3}{4}$ " 25mm (1"))	12 mm (1/2")

The B.T. chips shall be roughly cubical in shape and more or less of uniform size, rounded flaky, thin and elongated piece shall not be accepted. Before collection samples of B.T. Chips shall be got approved for size and shape by the engineer in charge. They shall be completely dry at the time of use.

B.T. Chips 12 mm Size:

The B.T. chips shall be obtained crushing black trap stone only in mechanical crusher. The black trap stone shall be hard, tough, durable plain dense closed grained and free from decayed and weathered portion S.B.T. chips shall be plain and free from coating of dust, dirt or other objectionable matter. B.T. Chips shall generally satisfy the following requirements as per Clause No.503.2.2 of M.O.T specifications and shall comply with I.S. 383-1970 in general.

Los Angeles abrasion value	I.S.2386 Part-IV	30% Maximum
Aggregate impact value	-do-	30% maximum
Water absorption	I.S.2385	2% maximum.

Grading:

Wholly passing through Square mesh.	Wholly retained in Square mesh.
12 mm size 20 mm (3/4") (About 1/2")	10 mm (3/4")

The B.T. chips shall be roughly cubical in shape and more or less or uniform in size, rounded flaky thin and elongated pieces shall not be accepted. Before collection of samples of B.T. chips shall be got approved for quality size and shape by the engineer in charge. They shall be completely dry at the time of use.

B.T. Chips 10 mm Size:

The B.T. chips shall be obtained crushing black trap stone only in mechanical crusher. The black trap stone shall be hard, tough, durable plain dense closed grained and free from decayed and weathered portion S.B.T. chips shall be plain and free from coating of dust, dirt or other objectionable matter. B.T. Chips shall generally satisfy the following requirements as per Clause No.503.2.2 of M.O.T specifications and shall comply with I.S. 383-1970 in general.

Los Angeles abrasion value	I.S.2386 Part-IV	25% Maximum
Aggregate impact value	-do-	30% maximum
Water absorption	I.S.2385	2% maximum.

Grading:

Wholly passing through Square mash.	Wholly retained in Square mash.
10 mm 12 mm (About 3/4") (about 1/2")	6 mm (about 1/4")

The B.T. chips shall be roughly cubical in shape and more or less or uniform in size, rounded flaky thin and elongated pieces shall not be accepted. Before collection of samples of B.T. chips shall be got approved for quality size and shape by the engineer in charge. They shall be completely dry at the time of use.

B.T. Chips 12 mm Size:

The B.T. chips shall be obtained crushing black trap stone only in mechanical crusher. The black trap stone shall be hard, tough, durable plain dense closed grained and free from decayed and weathered portion S.B.T. chips shall be plain and free from coating of dust, dirt or other objectionable matter. B.T. Chips shall generally satisfy the following requirements as per Clause No.503.2.2 of M.O.T specifications and shall comply with I.S. 383-1970 in general.

Los Angles abrasion value	I.S. 2386 Part-IV	35% Maximum
Aggregate impact value	-do	30% maximum
Water absorption	I.S. 2386	2% maximum.

Grading:

Wholly passing through Square mash	Wholly retained in Square mash.
6 mm 10 mm (about 1/4") (About 3/8%)	2.36 mm

The B.T. chips shall be roughly cubical in shape and more or less or uniform in size, rounded flaky thin and elongated pieces shall not be accepted. Before collection of samples of B.T. chips shall be got approved for quality size and shape by the engineer in charge. They shall be completely dry at the time of use.

M-1 Water:

- 1.1 Water shall not be salty or brackish and shall be clean, reasonably clear and free from objectionable quantities of silt and traces of oil and injurious alkalis, salts, organic matter and other deleterious material which will either weaken the mortar or concrete or cause efflorescence or attack the steel in R.C.C. Container for transport, storage and handling of water shall be clean. Water shall conform to the standards specified in LS. 456-1978.

- 1.2. If required by Engineer-in-charge it shall be tested by comparison with distilled water. Comparison shall be made by means of standard cement tests for soundness, time of setting and mortar strength as specified in LS. 269-1976. Any indication of unsoundness, change in time of setting by 30 minutes or more or decrease of more than 10 per cent in strength of mortar prepared with water sample when compared with the results obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test.
- 1.3. Water for curing mortar, concrete or masonry should not be too acidic or too alkaline. It shall be free of elements which significantly affect the hydration reaction or otherwise interfere with the hardening of concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or mortar surfaces.
- 1.4. Hard and bitter water shall not be used for curing.
- 1.5. Potable water will be generally found suitable for curing mortar or cement concrete.

M-3 Cement:

- 3.1 Cement shall be ordinary Portland slag cement as per LS. 269-1976 or Portland slag cement as per I.S. 455-1976 or as specified.

M-4 White Cement:

- 4.1 The white cement shall conform to I.S. 80412-E 1978.

M-5 Coloured Cement:

- 5.1 Coloured cement shall be with white or gray Portland cement as specified in the item of the work.
- 5.2 The pigments used for coloured cement shall be of approved quality and shall not exceed 10 % of cement used in the Mix. The mixture of pigment shall be properly grounded to have a uniform colour and shade. The pigments shall have such properties to provide for durability under exposure to sunlight and weather.
- 5.3. The pigment shall have the property such that it is neither affected by the cement nor detrimental to it.

M-6 Sand:

- 6.1. Sand shall be natural sand, clean, well graded, hard strong durable and gritty particle free from injurious amounts of dust clay, kankar nodules, soft or flaky particles shale, alkali; salts organic, matter, loam, mica or

other deleterious substance and shall be got approved from the Engineer-in-charge. The sand shall not contain more than 8 percent of silt as determined by field test, if necessary the sand shall be washed to make it clean.

6.2. Coarse Sand:

The fineness modulus of coarse sand shall not be less than 2.5 and shall not exceed 3.0. The sieve analysis of coarse shall be as under:

I. S. Sieve Designation	Percentage by weight passing sieve	I. S. Sieve Designation	Percentage by weight passing sieve
4.75 mm.	100	600 Micron	30 – 10
2.36 mm.	90 To 100	300 Micron	5 – 70
1.18 mm.	70 – 100	150 Micron	0 – 50

6.3 Fine Sand:

The fineness modulus shall not exceed 1.0. The sieve analysis of fine sand shall be as under

I. S. Sieve Designation	Percentage by weight passing sieve	I. S. Sieve Designation	Percentage by weight passing sieve
4.75 mm.	100	600 Micron	40 – 85
2.36 mm.	100	300 Micron	5 – 50
1.18 mm.	70 – 100	150 Micron	0 – 10

M-7 Stone Dust:

- 7.1 This shall be obtained from crushing hard black trap or equivalent. It shall not contain more than 8% of silt as determined by field test with measuring cylinder. The method of determining silt contents by field test is given as under
- 7.2 A sample of stone dust to be tested shall be placed without drying in 200 mm. measuring cylinder. The quantity of the sample shall be such that it fills the cylinder up to 100 mm. mark. The clean water shall be added up to 150 mm. mark. The mixture shall be stirred vigorously and the content allowed settling for 3 hours.
- 7.3. The height of silt visible as settled layer above the stone dust shall be expressed as percentage of the height of the stone dust below. The

stone dust containing more than 8% silt shall be washed so as to bring the silt content within the allowable limit.

- 7.4. The fineness modulus of stone dust shall not be less than 1.80.

M-8 Stone Grit:

- 8.1. Grit shall consist of crushed or broken stone and be hard strong, dense, durable, clean, of proper gradation and free from skin or coating likely to prevent adhesion of mortar. Grit shall generally be cubical in shape and as far as possible flaky elongated pieces shall be avoided. It shall generally comply with the provisions of I.S. 383-1970. Unless special stone of particular quarries is mentioned, grit shall be obtained from the best black trap or equivalent hard stone as approved by the Engineer-in-charge. The grit shall have no deleterious reaction with cement.

- 8.2. The grit shall conform to the following gradation as per sieve analysis:

I.S. Sieve Designation	Percentage by weight passing through sieve
12.50 mm	100 %
10.00 mm	85 – 100 %
4.75 mm	0 – 20 %
2.36 mm	0 – 25 %

- 8.3. The crushing strength of grit will be such as to allow the concrete in which it is used to built-up the specified strength of concrete.

- 8.4. The necessary tests for grit shall carried out as per the requirements of I.S. 2386 (Parts I to VII) 1963, as per instructions of the Engineer-in-charge. The necessity of test will be decided by the Engineer-in-charge.

M-11 Cement Mortar:

- 11.1. Water shall conform to specification M-1. Cement shall conform to specification M-3. Sand shall conform to M-6. 11.2. Proportion of Mix:

- 11.2.1 Cement and sand shall be mixed to specified proportion, sand being measured by measuring boxes. The proportion of cement will be by volume on the basis of 50 Kg. / Bag of cement being equal to 0.0342 cum. The mortar may be hand mixed or machine mixed as directed.

11.3. Preparation of mortar:

- 11.3.1 In hand mixed mortar cement and sand in the specified proportions shall be thoroughly mixed dry on a clean impervious platform by turning over at least 3 times or more till a homogenous mixture of uniform colour is obtained. Mixing platform shall be so arranged that no deleterious extraneous material shall get mixed with mortar or mortar shall flow out. While mixing, the water shall be gradually added and thoroughly mixed to form a stiff plastic mass of uniform colour so that each particle of sand shall be completely covered with a film of wet cement. The water cement ratio shall be adopted as directed.
- 11.3.2 The mortar so prepared shall be used within 30 minutes of adding water. Only such quantity of mortar shall be prepared as can be used within 30 minutes.

M-12 Stone Coarse Aggregate for Nominal Mix Concrete:

- 12.1. Coarse aggregate shall be machine crushed stone of black trap or equivalent and be hard, strong, dense, durable, clean and free from skin and coating likely to prevent proper adhesion of mortar.
- 12.2. The aggregate shall generally be cubical in shape. Unless special stones of particular quarries are mentioned aggregates shall be machine crushed from the best black trap or equivalent hard stone as approved. Aggregate shall have no deleterious reaction with cement. The size of the coarse aggregate for plain cement concrete and ordinary reinforced cement concrete shall generally be as per the table given below. However in case of reinforced cement concrete the maximum limit may be restricted to 6 mm. less than the minimum lateral clear distance between bars or 6 mm. less than the cover, whichever is smaller.

TABLE

I. S. Sieve Designation	Percentage passing for single sized aggregates of Nominal size			I. S. Sieve Designation	Percentage passing for single sized aggregates of Nominal size		
	40 mm	20 mm	40 mm		40 mm	20 mm	40 mm
80 mm.	---	---	---	12.5 mm.	---	---	---
63 mm.	100	---	---	10 mm.	0.5	0.02	0.30
40 mm.	85 –	100	---	4.75 mm.	---	0.5	0.5

	100						
20 mm.	0 – 20	85 – 100	100	2.35 mm.	---	---	---
16 mm.	---	---	85 – 100				

Note: This percentage may be varied somewhat by Engineer-in-charge when considered necessary for obtaining better density and strength of concrete.

12.3. The grading test shall be taken in the beginning and at the change of source of materials. The necessary test indicated in I.S. 383-1970 and I.S. 456-1978 shall have to be carried out to ensure the acceptability.

The aggregates shall be stored separately and handled in such a manner as to prevent the intermixing of different aggregates. If the aggregates are covered with dust, they shall be washed with water to make them clean.

M-13 Black Trap or Equivalent Hard Stone Coarse Aggregate:

13.1. Aggregate For Design Mix Concrete: Coarse aggregate shall be of machine crushed stone of black trap or equivalent hard stone and be hard strong dense- durable clean and free from skin and coating likely to prevent proper adhesion of mortar.

13.2. The aggregates shall generally be cubical in shape. Unless special stones of particular quarries are mentioned, aggregates shall be machine crushed from the best, black trap or equivalent hard stones as approved. Aggregate shall have no deleterious reaction with cement.

13.3. The necessary tests indicated in I.S. 383-1970 and I.S. 456-1978 shall have to be carried out to ensure the acceptability of the material.

13.4. If aggregate is covered with dust it shall be washed with water to make it clean.

M-15 Brick:

15.1. The bricks shall be hand or machine molded and made from suitable soils and kiln-burnt. They shall be free from crack and nodules of free lime. They shall have smooth rectangular faces with-sharp corners and shall be of uniform colour.

The bricks shall be molded with a frog of 100 mm. x 40 mm. and 10 mm. to 20 mm. deep on one of its flat sides. The bricks shall not break when thrown on the ground from a height of 600 mm.

15.2. The size of modular bricks shall be 190 mm. x 90 mm. x 90 mm.

15.3. The size of the conventional bricks shall be as under:

(9" x 4 3/8 " x 2 3/4 ") i.e. 225 x 110 x 75 mm.

15.4. Only bricks of one standard size shall be used on one work. The following tolerances shall be permitted in the conventional size adopted in a particular work.

Length $\pm 1/8"$ (3.0 mm) Width $\pm 1/16"$ (1.50 mm) Height $\pm 1/6"$ (1.50 mm.)

15.5. The crushing strength of the bricks shall not be less than 35 Kg./Cm². The average water absorption shall not be more than 20 percent by weight. Necessary tests for crushing strength and water absorption etc. shall be carried out as per I.S. 3495 (Part-I to IV) 1976.

M-16 Stone:

16.1. The stone shall be of the specified variety such as Granite/Trap Stone/Quartzite or any other type of good hard stones.

The stones shall be obtained only from the approved quarry and shall be hard, sound, durable and free from defects like cavities, cracks, sand holes, flaws, injurious veins, patches of loose or soft materials etc. and weathered portions and other structural defects or imperfections tending to affect their soundness and strength. The stone with round surface shall not be used. The percentage of water absorption shall not be more than 5% of dry weight, when tested in accordance with I.S. 1134- 1974. The minimum crushing strength of the stone shall be 200 Kg. / Sq.Cm unless otherwise specified.

16.2 The samples of the stone to be used shall be got approved before the work is started.

16.3 The Khanki facing stone shall be dressed by chisel as specified in the item for Khanki facing in required shape and size. The face of stone shall be so dressed that the bushing on the exposed face shall not project by more than 40 mm. from the general wall surface and on face to be plastered it shall not project by more than 19 mm. nor shall it have depressions more than 10 mm. from the average wall surface.

M-17 Laterite stone:

17.1. Laterite stone shall be obtained from the approved quarry. It shall be compacted in texture, sound, durable and free from soft patches. It shall

have a minimum crushing strength of 100 Kg. /Sq.Cm. in its dry condition. It shall not absorb water more than 20% of its own weight, when immersed for 24 hours in water. After quarrying the stone shall be allowed to weather for some time before using in work.

17.2. The stone shall be dressed into regular rectangular blocks so that all faces are free from waviness and unevenness, edges true and square.

17.3. Those types of stone in which white clay occur, should not be used.

17.4. Special corner stone's shall be provided where so directed.

M-18 Mild Steel Bars:

18.1 Mild steel bars reinforcement for R.C.C. work shall conform to I.S. 432 (Part-II) 1966 and shall be of tested quality. It shall also comply with relevant part of I.S. -t56- 1978.

18.2 All the reinforcement shall be clean and free from dirt, paint, grease, mill scale or loose or thick rust at the time of placing.

18.3. For the purpose of payment, the bar shall be measured correct up to 100 mm. length and weight payable worked out at the rate specified below:

1.	6 mm.	0.22 Kg. /Rmt.	8.	20 mm	2.47 Kg. /Rmt.
2.	8 mm	0.39 Kg. /Rmt.	9.	22 mm	2.98 Kg. /Rmt.
3.	10 mm	0.62 Kg. /Rmt.	10.	25 mm	3.85 Kg. /Rmt.
4.	12 mm	0.89 Kg. /Rmt.	11.	28 mm	4.83 Kg. /Rmt.
5.	14 mm	1.21 Kg. /Rmt.	12.	32 mm	6.31 Kg. /Rmt.
6.	16 mm	1.58 Kg. /Rmt.	13.	36 mm	7.99 Kg. /Rmt.
7.	18 mm	2.00 Kg./Rmt.	14.	40 mm	9.86 Kg./Rmt.

M-19 High Yield Strength Steel Deformed Bars:

19.1. High yield strength steel deformed bars be either cold twisted or hot rolled shall conform to I.S. 1739-1966 and I.S. 1139- 1966 respectively.

19.2. Other provision and requirements shall conform to specification No. M-18 for Mild steel bars.

M-20 High Tensile Steel Wires:

20.1. The high tensile wires for the use in pre stressed concrete work shall confirm to I.S. 2090-1962.

20.2. The tensile strength of the high tensile steel bars shall be as specified in the item. In absence of the given strength, the minimum strength shall

- he taken as per Para 6.1 of I.S. 1785-1962. Testing shall be done as per I.S. requirements. 20.3. The high tensile steel shall be free from loose mill scale, rust oil, grease, or any other harmful matter. Cleaning of steel bars may be carried out by immersion in solvent solution, wire brushing or passing through a pressure box containing carborandum.
- 20.4. The high tensile wire shall be obtained from manufacturers in coil having diameter not less than 350 times the diameter of wire itself so that wire springs back straight on being uncoiled.

M-21 Mild Steel Binding Wires:

- 21.1. The mild steel wire shall be of 1.63 mm. or 1.22 mm. (16 or 18 gauge) diameter and shall conform to I.S. 280-1972.
- 21.2. The use of black wire will be permitted for binding reinforcement bars. It shall be free from rust, oil paint, grease, loose mill scale or any other undesirable coating which may prevent adhesion of cement mortar.

M-22 Structural Steel:

- 22.1 All structural steel shall conform to I.S. 226-1965. The steel shall be free from the defects mentioned in I.S. 226-1975 and shall have a smooth finish. The material shall be free from loose mill scale, rust pits or other defects affecting the strength and durability. Rivet bars shall conform to I.S. 1148-1973.
- 22.2 When the steel is supplied by the Contractor test certificates of the manufacturers shall be obtained according to I.S. 226-1975 and other relevant Indian Standards.

M-26 Shuttering:

- 26.1. The shuttering shall be either of wooden planking of 30 mm minimum thickness with or without steel lining or of steel plates stiffened by steel angles. The shuttering shall be supported on battens and beams and props of vertical bracing properly cross braced together so as to make the centering rigid. In places of bulged props, brick pillar of adequate section built in mud mortar may be used.
- 26.2. The form work shall be sufficiently strong and shall have camber, so that it assumes correct shape after deposition of the concrete and shall be able to resist forces caused by vibration of live load of men working over it and other incidental loads associated with it. The shuttering shall have smooth and even surface and its joints shall not permit leakage of cement grout.

- 26.3. If at any stage of work during or after placing concrete in the structure, the form work sags or bulges out beyond the required shape of the structure, the concrete shall be removed and work redone with fresh concrete and adequately rigid form work. The complete formwork shall be got inspected by and got approved from the Engineer-in-charge, before the reinforcement bars are placed in position.
- 26.4. The props shall consist of bullies having 100 mm. minimum diameters measured at mix length and 80 mm. at thin end and shall be placed as per design requirement. These shall rest squarely on wooden sole plates 40 mm. thick and minimum bearing area if 0-10 sq. m. lay on sufficiently hard base.
- 26.5. Double wedges shall further be provided between the sole plate and the wooden props so as to facilitate tightening and easing of shuttering without jerking the concrete.
- 26.6 The timber used in shuttering shall not be so dry as to absorb water from concrete and swell or bulge nor so green or wet as to shrink after erection. The timber shall be properly sawn and planed on the sides and surface coming in contact with concrete. Wooden form work with metal sheet lining or steel plates stiffened by steel angles shall be permitted.
- 26.7 As far as practicable, clamps shall be used to hold the forms together and use of nails and spikes avoided.
- 26.8 The surface of timber shuttering that would come in contact with concrete shall be well wetted and coated with soap solution before, the concreting is done. Alternatively coat of raw linseed oil or oil of approved manufacturer may be applied in place of soap solution. In case of steel shuttering either soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface. Under no circumstances black or burnt oil shall be permitted.
- 26.9 The shuttering for beams and slabs shall have camber of 4 mm. per meter (1 in 250) or as directed by the Engineer-in-charge so as to offset the subsequent deflection. For cantilevers, the camber at free end shall be $1/50$ of the projected length or as directed by the Engineer-in-charge.

M-27 Expansion Joints-Pre-Molded Filler:

- 27.1 The item provides for expansion joints in R.C.C. frame structures for internal joints, as well as exposed joints, with the use of pre molded bituminous joint filler.
- 27.2 Pre molded bituminous joint filler, i.e. performed strip of expansion joint filler shall not get deformed or broken by twisting, bending or other handling when exposed to atmospheric condition. Pieces of joint filler that have been damaged shall be rejected.
- 27.3 Thickness of the pre-molded joint filler shall be 25 mm. unless otherwise specified.
- 27.4 Pre molded bituminous joint filler shall conform to I.S. 1838-1961

M-44 Paints:

44.1 (A) Oil paints:

- 44.1.1 Oil paints shall be of the specified colour and shade, and approved. The ready mixed paint shall only be used. However, if ready mixed paint or specified shade or tint is not available, white ready mixed paint with approved Steiner will be allowed. In such a case, the contractor shall ensure that the shade of the paint so allowed shall be uniform.
- 44.1.2 All the paints shall meet with following general requirements:
- (i) Paint shall not show excessive setting in a freshly opened full can and shall easily be redispersed with a paddle to a smooth homogeneous state. The paint shall show no curdling, livering, caking or colour separation and shall be free from lumps and skins.
 - (ii) The paint as received shall brush easily, possess good leveling properties and show no running or sagging tendencies.
 - (iii) The paint shall not skin within 48 hours in a three quarters filled closed container.
 - (iv) The paint shall dry to a smooth uniform finish free from roughness, grit, unevenness and other imperfections.
- 44.1.3 Ready mixed paint shall be used exactly as received from the manufacturers and generally according to their instructions and without any admixtures whatsoever.

44.2 (B) Enamel Paints:

- 44.2.1 The enamel paint shall satisfy in general requirements as mentioned in specification of oil paints. Enamel paint shall conform to I.S. 2933 - 1975.

M-47 Flooring Tiles:

47.4. (D) Chequered Tiles:

- 47.4.1 Chequered tiles shall be plain cement tiles or marble mosaic tiles. The former shall have the same specification as per (A) above and the latter as per marble mosaic tiles as per (C) except as mentioned below.
- 47.4.2 The tiles shall be of nominal size of 250 mm x 250 mm or as specified. The centre to centre distance of chequered shall not be less than 25 mm and not more than 50mm. The overall thickness of the tile shall be 22 mm.
- 47.4.3 The grooves in the chequers shall be uniform and straight. The depth of the grooves shall not be less than 3 mm. The chequered shall be plain, coloured or mosaic as specified. The thickness of the upper layer measured from the top of the chequered shall not be less than 6 mm. The tiles shall be given the first grinding with machine before delivery to site.
- 47.4.4 Tiles shall conform to relevant I.S. 1237 – 1980.

Signature of contractor
Place
Date

CHIEF OFFICER
UNA NAGARPALIKA
UNA

7.2 TECHNICAL SPECIFICATION OF ITEMS

Technical specifications are as per R&B Specifications or as directed by Engineer – in – charge / Consultant

All work will be as per Gujarat R&B PWD specifications where available. Where not available, CPWD specifications for the items will be referred.

Contractor's Signature with address

Place:

Date:

**CHIEF OFFICER
UNA NAGARPALIKA
UNA
Dist: Gir Somnath**

ALL WORK WILL BE AS PER GUJARAT R & B PWD SPECIFICATIONS WHERE AVAILABLE. WHERE NOT AVAILABLE, CPWD SPECIFICATIONS FOR THE ITEMS WILL BE REFERRED

ITEM NO. 1: BOX CUTTING THE ROAD SURFACE TO PROPER SLOPE AND CAMBER FOR MAKING A BASE FOR ROAD WORK INCLUDING REMOVING THE EXCAVATED STUFF AND DEPOSITING ON THE ROAD SIDE SLOPE AS DIRECTED UPTO 50 M.

1. Specification No. 162 and 553 of P.W.D. Hand book volume II and the following additional specifications be applicable here.
2. Cutting shall be done in proper grade & camber as per measurements given, Care must be taken the tall slopes are evenly and truly dressed. Cutting shall be done to the exact depth required and shall be as per formation level in proper grade and the camber. If extra depth of cutting is done due to negligence of contractor the same shall be refilled with approved quality of materials duly consolidated to the satisfaction of the Engineer-in-charge (Without extra cost) Box cutting for soling and metalling in required width the depth shall be done
3. The stuff received from the cutting shall be utilized for filling cuts and correcting side slopes of bank with all lead and lift as directed. Useful stuff shall be careful stacked separately as directed.
4. The measurement shall be taken as per cross section measurement of the cutting based on length, breadth, depth measured with tape at every 25 meters interval.
5. The payment shall be made on cum basis.

ITEM NO. 3: PROVIDING AND LAYING COMPACTED W.B.M. 100 MM. THICK OF GRADING-I B.T. METAL OF SIZE 40 MM TO 63 MM INCLUDING USING 22% STONE SCREENING 13.2 MM SIZE AND 7% STONE DUST AS FILLER INCLUDING SPREADING, WATERING AND CONSOLIDATION BY VIBRATORY ROLLER ETC. COMPLETE

ITEM NO. 4: PROVIDING AND LAYING COMPACTED W.B.M. 150 MM. THICK OF GRADING-II B.T. METAL OF SIZE 40 MM TO 63 MM IN TWO LAYERS INCLUDING USING 13% STONE SCREENING 13.2 MM SIZE AND 7% STONE DUST AS FILLER INCLUDING SPREADING, WATERING AND CONSOLIDATION BY VIBRATORY ROLLER ETC. COMPLETE.

This work shall consist of clean, crushed aggregates mechanically interlocked by rolling and bonding together with screening, binding material where necessary and water laid on a properly prepared sub-grade / sub base / base or existing pavement, as the case may be and finished in accordance with the requirements of these specifications and it close conformity with the lines, grades, cross sections and thickness as per approved plans or as directed by the Engineer.

It is, however, not desirable to lay water bound macadam on an existing thin black topped surface without providing adequate drainage facility for water that would get accumulated at the interface of existing bituminous surface and water bound macadam.

Materials:

Coarse aggregates:

Coarse aggregates shall be either crushed or broken stone of BT type only. The aggregates shall conform to the physical requirements set forth in Table 400-6. The type and size range of the aggregate shall be specified in the Contract or shall be as specified by the Engineer. If the water absorption value of the coarse aggregate is greater than 2 per cent, the soundness test shall be carried out on the material delivered to site as per IS: 2386 (Part 5).

Crushed or broken stone:

The crushed or broken stone shall be hard, durable and free from excess flat, elongated, soft and disintegrated particles, dirt and other deleterious materials.

TABLE-400-6

PHYSICAL REQUIREMENTS OF COARSE AGGREGATES FOR WATER BOUND MACADAM FOR SUBBASE / BASE COURSES

	Test	Test Method	Requirements
1.	*Los Angeles Abrasion value (PART-4) Or *Aggregate impact value. (PART-4)	IS: 2386 IS: 2386 or IS: 5640**	40 per cent (Max) 30 per cent (Max)
2.	Combined Flakiness and Elongation indices (Total)	IS: 2386 (PART-I)	30 per cent (Max)
*	Aggregate may satisfy requirements of either of the two tests.		
**	Aggregates like brick metal, kankar, Laterite etc. which get softened in presence of water shall be tested for impact value under wet conditions in accordance with IS: 5640;		

*** The requirement of flakiness index and elongation index shall be enforced only in the case of crushed broken stone and crushed slag.

Grading requirement of coarse aggregates:

The coarse aggregates shall conform to one of the Grading given in Table 400-7 as specified, provided; however, the use of Grading No.1 shall be restricted to sub-base course only.

TABLE 400-7

GRADING REQUIREMENTS OF COARSE AGGREGATES

Grading No.	Size Range	IS Sieve Designation	Percent by weight passing
1.	90mm to 45 mm	125 mm	100
		90mm	90-100
		63mm	25-60
		45mm	0-15
		22.4 mm	0-5
2.	63mm to 45 mm	90 mm	100
		63 mm	90-100
		53 mm	25-75
		45 mm	0-15
		22.4 mm	0-5
3.	53 mm to 22.4 mm	63 mm	100
		53 mm	95-100
		45 mm	65-90
		22.4 mm	0-10
		11.2 mm	0-5

Note: The compacted thickness for a layer with Grading I shall be 100 mm while for layer with other Grading i.e., 2 & 3, it shall be 75 mm.

Screenings:

Screenings to fill voids in the coarse aggregate shall generally consist of the same material as the coarse aggregate. However, where permitted, predominantly non-plastic material such as murrum or gravel (other than rounded river borne material) may be used for this purpose provided liquid limit and plasticity index of such material are below 20 & 6 respectively and fraction passing 75 micron sieve does not exceed 10 per cent.

Screening shall conform to the grading set forth in Table 400-8. The consolidated details of quantity of screening required for various grades of stone aggregates are given in Table 400-9. The table also gives the quantities of materials (loose) required for 10 m² for sub-base/base compacted thickness of 100/75 mm.

The use of screenings shall be omitted in the case of soft aggregates such as brick metal, kankar, Laterite, etc. as they are likely to get crushed to a certain extent under rollers.

TABLE 400-8

GRADING FOR SCREENINGS

Grading classification	Size of screenings	IS Sieve Designation	Percent by weight passing the IS Sieve.
A	13.2 mm	13.2 mm	100
		11.2 mm	95-100
		5.60 mm	15-35
		180 micron	0-10
B	11.2 mm	11.2 mm	100
		5.60 mm	90-100
		180 micron	15-35

TABLE 400-9

APPROXIMATE QUANTITIES OF COARSE AGGREGATES AND SCREENINGS REQUIRED FOR 100/75 MM COMPACTED THICKNESS OF WATER BOUND MACADAM (WBM) SUBBASE / BASE COURSE FOR 10 M² AREAS

Screenings	Classification	Size	Range	Compacted thickness
Loose Qty.				
Stone screening Crushable type such as Murrum or Gravel				
Grading classification & size for WBM				
Sub base / base course				
(Loose quantity)				
Grading classification & size				
Loose Qty.				
Grading 1	90 mm to 45 mm	100 mm	1.21 to 1.43 m ³	
Type A		13.2 mm	0.27 to 0.30 m ³	
Not uniform	0.30 to 0.32 m ³			
Grading 2	63 mm to 45 mm	75 mm	0.91 to 1.07 m ³	
Type A		13.2 mm	0.12 to 0.15 m ³	
Not uniform	0.22 to 0.24 m ³			
Grading 2	63 mm to 45 mm	75 mm	0.91 to 1.07 m ³	
Type B		11.2 mm	0.20 to 0.22 m ³	
Not uniform	0.22 to 0.24 m ³			
Grading 3	53 mm 75 mm	0.91 to 3		
Type B	0.18 to 3			
Not uniform	0.22 to 3			
to 22.4 mm				
1.07 m ³	11.2 mm	0.21 m ³	0.24 m ³	

Binding material: Binding material to be used for water bound macadam as a filter material for preventing raveling, shall comprise of a suitable material approved by the Engineer having a Plasticity Index (PI) value less than 6 as determined in accordance with IS : 2720 (Part-5).

The quantity of binding material where it is to be used will depend on the type of screenings. Generally, the quantity required for 75 mm compacted thickness of water bound macadam will be 0.06-0.09 m³ / 10m² and 0.08-0.10 m³ / 10m² for 100 mm compacted thickness.

The above-mentioned quantities should be taken as a guide only, for estimation of quantities for construction etc. Application of binding materials may not be necessary when the screenings used are of crushable type such as murrum or gravel.

Construction Operations:

Preparation of base:

The surface of the sub-grade / sub-base / base to receive the water bound macadam course shall be prepared to the specified lines and cross-fall (camber) and made free of dust and other extraneous material. Any ruts or soft yielding places shall be corrected in an approved manner and rolled until firm surface is obtained if necessary by sprinkling water. Any sub base / base / surface irregularities, where predominant, shall be made good by providing appropriate type of profile corrective course (leveling course) to Clause 501 of MoRT&H Specifications.

As far as possible, laying water bound macadam course over an existing thick bituminous layer may be avoided since it will cause problems of internal drainage of the pavement at the interface of two courses. It is desirable to completely pick out the existing thin bituminous wearing course where water bound macadam is proposed to be laid over it. However, where the intensity of rain is low and the interface drainage facility is efficient, water bound macadam can be laid over the existing thin bituminous surface by cutting 50 mm x 50 mm furrows at an angle of 45 degrees to the center line of the pavement at one metre intervals in the existing road. The directions and depth of furrows shall be such that they provide adequate bondage and also serve to drain water to the existing granular base course beneath the existing thin bituminous surface.

Spreading coarse aggregates: The coarse aggregates shall be spread uniformly and evenly upon the prepared sub-grade / sub-base / base to proper profile by using templates placed across the road about 6m apart, in such quantities that the thickness of each compacted layer is not more than 100mm for Grading 1 and 75 mm for Grading 2 & 3, as specified in Clause 4042.5 of MoRT&H. Wherever possible, approved mechanical devices such as aggregate spreader shall be used to spread the aggregates uniformly so as to minimize the need for manual rectification afterwards. Aggregates placed at locations which are inaccessible to

the spreading equipment, may be spread in one or more layers by any approved means so as to achieve the specified results.

The spreading shall be done from stockpiles along the side of the roadway or directly from vehicles. No segregation of large or fine aggregates shall be allowed and the coarse aggregate, as spread shall be of uniform gradation with no pockets of fine material. The surface of the aggregates spread shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregates as may be required. The surface shall be checked frequently with a straight edge while spreading and rolling so as to ensure a finished surface as per approved drawings.

The coarse aggregates shall not normally be spread more than 3 days in advance of the subsequent construction operations.

Rolling:

Immediately following the spreading of the coarse aggregate, rolling shall be started with rollers of 80 to 100 kN capacity tandem or vibratory rollers of 80 to 100 kN static weight. The type of roller to be used shall be approved by the Engineer based on trial run. Except on super-elevated portions where the rolling shall proceed from inner edge to the outer, rolling shall begin from the edges gradually progressing towards the center. First the edge/ edges shall be compacted with roller running forward and backward. The roller shall then move inward parallel to the center line of the road, in successive passes uniformly lapping preceding tracks by at least one-half widths.

Rolling shall be discontinued when the aggregates are partially compacted with sufficient void space in them to permit application of screenings. However, where screenings are not to be applied, as in the case of crushed aggregate like brick metal, laterite and Kankar, compaction shall be continued until the aggregates are thoroughly keyed. During rolling, slight sprinkling of water may be done, if necessary. Rolling shall not be done when the sub-grade is soft or yielding or when it causes a wave-like motion in the sub-grade or sub-base course.

The rolled surface shall be checked transversely and longitudinally, with templates and any irregularities corrected by loosening the surface, adding or removing necessary amount of aggregates and re-rolling until the entire surface forms to desired cross-fall (camber) and grade. In no case shall the use of screening be permitted to make up depressions. Material, which gets crushed excessively during compaction or becomes segregated shall be removed and replaced with suitable aggregates. It shall be ensured that shoulders are built up simultaneously along with water bound macadam course.

Application of Screenings:

After the coarse aggregate has been rolled to Clause 404.3.4 of MoRT&H, screenings to completely fill the interstices shall be applied gradually over the surface. These shall not be damp or wet at the time of application. Dry rolling

shall be done while the screenings are being spread so that vibrations of the roller cause them to settle into the voids of the coarse aggregate. The screenings shall not be dumped in piles but be spread uniformly in successive thin layers either by the spreading motions of hand shovels or by mechanical spreaders, or directly from tipper with suitable grit spreading arrangement. Tipper operating for spreading the screenings shall be so driven as not to disturb to coarse aggregate.

The screening shall be applied at a slow and uniform rate so as to ensure filling of all voids. This shall be accompanied by dry rolling and brooming with mechanical brooms, hand brooms or both, In no case shall the screenings be applied so fast and thick as to form cakes or ridges on the surface in such a manner as would prevent filling of voids or prevent the direct bearing of the roller on the coarse aggregate. The spreading, rolling, and brooming of screenings shall be carried out in only such length of the road which could be completed within one day's operation.

Sprinkling of water and grouting:

After the screenings have been applied, the surface shall be copiously sprinkled with water, swept and rolled. Hand brooms shall be used to sweep the wet screenings into voids and to distribute them evenly. The sprinkling, sweeping and rolling operation shall be continued, with additional screenings applied as necessary until the coarse aggregate has been thoroughly keyed, well-bounded and firmly set in its full depth and a grout has been formed of screening, Care shall be taken to see that the base or sub grade does not get damaged due to the addition of excessive quantities of water during construction.

In case of lime treated soil sub-base, construction of water bound macadam on top of it can cause excessive water to flow down to the lime treated sub base before it has picked up enough strength (is still "Green") and thus cause damage to the sub-base layer. The layer of water bound macadam layer in such cases shall be done after the sub-base attains adequate strength, as directed by the Engineer.

Application of Binding Material:

After the application of screenings in accordance with Clauses 404.3.3 and 404.3.6 of MoRT&H the binding material where it is required to be used (Clause 404.2.7 of MoRT&H) shall be applied successively in two or more thin layers at a slow and uniform rate. After such application, the surface shall be copiously sprinkled with water, the resulting slurry swept in with hand brooms, or mechanical brooms to fill the voids properly, and rolled during which water shall be applied to the wheels of the rollers if necessary to wash down the binding material sticking to them. These operations shall continue until resulting slurry after filling of voids, forms a wave a head of the wheels of the moving roller.

Setting and drying:

After the final compaction of water bound macadam course, the pavement shall be allowed to dry overnight. Next morning hungry sports shall be filled with screenings or binding material as directed, lightly sprinkled with water if necessary and rolled. No traffic shall be allowed on the road until the macadam has set. The Engineer shall have the discretion to stop hauling traffic from using the completed water bound macadam course, if in his opinion it would cause excessive damage to the surface. The compacted water bound macadam course should be allowed to completely dry and set before the next pavement course is laid over it.

Surface Finish and Quality Control of Work

The surface finish of construction shall conform to the requirements of Clause 902 of MoRT&H. Control on the quality of materials and works shall be exercised by the engineer in accordance with Section 900 of MoRT&H.

The water bound macadam work shall not be carried out when the atmospheric temperature is less than 0°C in the shade. Reconstruction of defective macadam: The finished surface of water bound macadam shall conform to the tolerance of surface regularity as prescribed in Clause 902 of MoRT&H. However, where the surface irregularity of the course exceeds the tolerances or where the course is otherwise defective due to sub-grade soil mixing with the aggregates, the course to its full thickness shall be scarified over the affected area, reshaped with added material or removed and replaced with fresh material as applicable and re-compacted. In no case shall depressions be filled up with screenings or binding materials.

Arrangement for Traffic

During the period of construction, the arrangement of traffic shall be done as per Clause 112 of MoRT&H.

Measurements of payment

Water bound macadam shall be measured as finished work in position in cubic meters.

Rate

The Contract unit rate for water bound macadam sub-base/base course shall be payable in full for carrying out the required operations including full compensation for all components listed below including arrangement of water used in the work as approved by the Engineer.

- (i) Making arrangements for traffic to Clause 112 of MoRT&H except for initial treatment to verges, shoulders and construction of diversions;
- (ii) Furnishing all materials to be incorporated in the work including all royalties, fees, rents where necessary and all leads and lifts;
- (iii) All labour, tools, equipment and incidentals to complete the work to the specifications;

- (iv) Carrying out the work in part widths of road where directed; and
- (v) Carrying out the required tests for quality control.

ITEM NO. 6: PROVIDING AND LAYING 37.5MM THICK COMPACTED BITUMENOUS MACADAM USING BLACK CRUSHED STONE AGGREGATE AND FILLER MATERIAL AS PER GRADATION OF M.O.R.T. & H. SPECIFICATION INCLUDING USING CATONIC RAPID SETTING EMULSION FOR TACK COAT AT THE RATE OF 2.50 KG/10 SQM., BY MECHANICAL SPRAYER AND BITUMEN OF 60-70 GRADE FOR MIXING AT THE RATE OF 34.00KG/M.T. BY WEIGHT OF TOTAL MIX (I.E.3.4%) AND MIXING THE AGGREGATE AND BITUMEN BY CONTINUOUS DRUM MIX PLANT AND SPREADING THE SAME BY PAVER FINISHER AND CONSOLIDATION BY VIBRATORY ROLLER INCLUDING COST OF ALL MATERIALS, FUEL, LABOURS, TOOLS AND PLANTS, USING CONTRACTOR'S OWN MACHINERIES.

ITEM NO. 7: PROVIDING AND LAYING 50MM THICK COMPACTED BITUMENOUS MACADAM USING BLACK CRUSHED STONE AGGREGATE AND FILLER MATERIAL AS PER GRADATION OF M.O.R.T. & H. SPECIFICATION INCLUDING USING CATONIC RAPID SETTING EMULSION FOR TACK COAT AT THE RATE OF 2.50 KG/10 SQM., BY MECHANICAL SPRAYER AND BITUMEN OF 60-70 GRADE FOR MIXING AT THE RATE OF 34.00KG/M.T. BY WEIGHT OF TOTAL MIX (I.E.3.4%) AND MIXING THE AGGREGATE AND BITUMEN BY CONTINUOUS DRUM MIX PLANT AND SPREADING THE SAME BY PAVER FINISHER AND CONSOLIDATION BY VIBRATORY ROLLER INCLUDING COST OF ALL MATERIALS, FUEL, LABOURS, TOOLS AND PLANTS, USING CONTRACTOR'S OWN MACHINERIES.

Scope:

The work shall consist of construction in one course having 50mm. thickness in single course of compacted crushed aggregates premixed with a bituminous

binder, to serve as base / binder course, laid immediately after mixing on a base prepared previously in accordance with the requirement of these specification and in conformity with the lines, grades and cross section shown on the drawing or as directed by the Engineer. Bituminous macadam is more open graded than the dense graded bituminous materials described in Clause 507,508 & of MORT & H.

Materials:

Bitumen:

The bitumen shall be paving bitumen of Penetration Grade (80/100) complying with Indian Standard Specifications for "Paving Bitumen" Is : 73. The actual grade of bitumen to be used shall be decided by the Engineer appropriate to the region, traffic, rainfall and other environment conditions. Guidelines on selection of bitumen shall be as per Appendix 4 of MORT & H.

Coarse Aggregates:

The aggregates shall consist of crushed rock, crushed gravel or other hard materials retained on 2.36 mm. sieve. They shall be clean, hard, durable, of cubical shape and free from dust and soft friable matter, organic or other deleterious matter and adherent coating.

Where the Contractor's selected source of aggregates have poor affinity for bitumen, as a condition for the approved of that source, bitumen shall be treated with an approved anti stripping agent, as per the manufacturer's recommendations, without additional payment. Before approval of the source, aggregates shall be tested for stripping. The aggregate shall satisfy the physical requirement set forth in table 500-3, where crushed gravel is proposed for use as aggregate. Not less than 90 percent by weight of the crushed materials retained on 4.75 mm. sieve shall have at least two fractured faces.

Fine aggregates:

Fine aggregates shall consist of cursed or naturally occurring material, or a combination of the two, passing 2.36 mm. sieve and retained on 75 micron sieve. They shall be clean, hard, durable and free from dust, and soft or friable matter, organic or other deleterious matter.

TABLE 500-3
PHYSICAL REQUIREMENT FOR COARSE AGGREGATES FOR BITUMINOUS
MACADAM

Sr. No.	Test	Test Method	Requirement
1.	Strength*: Los Angles Abrasion Value	IS:2386(Part-4)	40% Maximum
2.	Strength*: Aggregate impact Value	IS:2386(Part-4)	30% Maximum
3.	Particle shape : Flakiness & Elongation Index (Combined)	IS 2386 (Part-1)	30% Maximum
4.	Cleanliness : Grain size analysis	IS:2386(Part-1)	Maximum 5% Passing 0.075 mm. sieve
5.	Coating and stripping of bitumen aggregate mixtures	IS:6241	Minimum retained coating 95%
6.	Soundness	IS-2386 (Part-5)	
	i) Loss with sodium sulphate 5 cycles		12% Maximum
	ii) Loss with Magnesium sulphate 5 cycles		18% Maximum
7.	Water Absorption	IS:2386 (Part-3)	02% Maximum
8.	Water Sensitivity**:Retained Tensile Strength		Minimum 80%

* Aggregate may satisfy requirements of either of the two tests.

** The water sensitivity test is only to be carried out if the minimum retained coating in the stripping test is less than 95%

The elongation test to be done only on non-flays aggregates in the sample.

Aggregates grading and binder content :

When tested in accordance with IS:2386 Part I (wet sieving method), the combined aggregate grading for the particular mixture shall fall within the limits shown in Table 500-4 for the grading specified in the contract. The type and quantity of bitumen, and appropriate thickness, are also indicator for each mixture type.

Proportioning of materials:

The aggregate shall be proportioned to produce a uniform mixture complying with the requirements of Table 500-4 of MORT & H. The binder content shall be within a tolerance of + 0.3 percent by weight of total mixture when individual specimens are taken for quality control tests in accordance with the provisions of Section 900 of MORT & H. The bitumen content for premixing shall be 3.4 percent by weight of the total mix except when otherwise directed by the Municipal Engineer.

TABLE NO. 500-4**AGGREGATE GRADING FOR BITUMINOUS MACADAM**

Mix designation	Nominal size Layer	Grading 1 100 mm.	Grading 2 50 – 75 mm.	40 mm.	19 mm.	80 – Cumulative % by weight of total Aggregate passing.
	IS Sieve (mm.)					
45.0						----
37.5						----
26.5	19.0				--100	--90-100
13.2						--56-88
4.75	2.36				--16-36	--4-19
0.30						--2-10
0.075						--0-8
Bitumen content, % by weight	--of total					3.4%
mixture						
Bitumen grade	--					80 /100

Notes: 1: Appropriate bitumen contents for condition in collar area of India may be up to 0.5% higher subject to the approval of the Engineer.

Construction Operation:**Weather and seasonal limitations:**

The laying shall be suspended while freestanding water is present on the surface to be covered, or during rain, fog and dust storms. After rain, the bituminous surface, primer or tack coat, shall be blown off with a high pressure air jet to remove excess moisture, or the surface left to dry before laying shall start. Laying of bituminous mixtures shall not be carried out when the air temperature at the surface on which it is to be laid is below 100 C or when the wind speed at any temperature exceeds 40 Km / h at 2 m. height specifically approved by the Engineer-in-charge

Preparation of the base:

The base on which bituminous macadam is to be laid shall be prepared, shaped and conditioned to the required profile in accordance with Clause 501.8 & 902.3 of MORT & H as appropriate, and prime, coat shall be applied in accordance with Clause 502 of MORT & H where specified, or as directed by Engineer.

Tack coat:

The work shall consist of the application of a single coat of rapid setting emulsion bituminous material to an existing bituminous road surface preparatory to the superimposition of a bituminous mi, when specified in the Contract or instructed by the Engineer.

Binder:

The binder used for mixing shall be 80-100 Grade bitumen complying with IS 73 or a type and grade as specified in the Contractor or as directed by the Engineer.

Weather and seasonal Limitations:

Bituminous material shall not be applied to a wet surface or during a dust storm or when the weather is foggy, rainy or windy or when the temperature in the shade is less than 100C.

Equipment:

The tack coat distributor shall be self propelled or towed bitumen pressure sprayer, equipped for spraying the material uniformly at a specified rate. Hand spraying of small areas, inaccessible to the distributor, or in narrow strips shall be sprayed with a pressure hand sprayer, or as directed by the Engineer.

Preparation of base:

The surface on which the tack coat is to be applied shall be cleaned and free from dust, dirt, and any extraneous material, and to be otherwise prepare in accordance with the requirements of Clauses 501.8 and 902 of MORT & H as appropriate. Immediately before the application of the tack coat, the surface shall be swept clean with a mechanical broom, and high-pressure air jet, or by other means as directed by the Engineer.

Application of tack coat:

The application of tack coat shall be at the rate of 2.50 Kg per 10 Sqm. As specified in the Contract, and shall be applied uniformly. If rate of application of Tack coat is not specified in the contract then it shall be at the rate specified in Table 500-2. The method of application of the tack coat will depend on the type of equipment to be used, size of nozzles, pressure at the spray bar, and speed of

forward movement. The contractor shall demonstrate at a spraying trial that the equipment and method to be used is capable of producing a uniform spray, within the tolerances specified. Where the materials to receive an overlay is freshly laid bituminous layer, that has not been subjected to traffic, or contaminated by dust, a tack coat is not mandatory where the overlay is complete within two days. Work should be planned so that no more than the necessary tack coat for the day's operation is placed on the surface.

Type of Surface	Quantity of liquid bituminous Material in Kg. per Sq.m. area
i) Normal bituminous surfaces	0.20 to 0.25
ii) Dry and hungry bituminous surfaces	0.25 to 0.30
iii) Granular surface treated with primer	0.25 to 0.30
iv) Non bituminous surface	
(a) Granular base (not primed)	0.35 to 0.40
(b) Cement concrete pavement	0.30 to 0.35

Curing of tack coat:

The tack coat shall be applied just ahead of the oncoming bituminous construction. The tack coat shall be left to cure until all the volatiles evaporated before any subsequent construction is started. No plant or vehicles shall be allowed on the tack coat other than those essential for the construction.

Quality control of Tack Coat work:

For control of the quality of materials supplied and the works carried out, the relevant provision of section 900 of MORT & H shall apply.

Preparation and transport of mix:

Mixing:

Pre-mixed bituminous materials, including bituminous macadam, dense bituminous macadam, semi-dense bituminous concrete and bituminous concrete shall be prepared in Drum Mix Plant of adequate capacity and capable of yielding a mix of proper and uniform quality with thoroughly coated aggregates. Appropriate mixing temperature can be found in Table 500-5 of these specifications, the difference in temperature between the binder and aggregate should at no time exceed 140 C. In order to ensure uniform quality of the mix and between coatings of aggregates, the Drum Mix Plant shall be calibrated from time to time.

If a continuous mixing plant is to be used for mixing the bituminous bound macadam, the Contractor must demonstrate by laboratory analysis that the cold feed combined grading is within the grading limits specified for that bituminous bound material. In case of a designed job mix, the bitumen and the filler content shall be derived using this combined grading. Further details are available in the Manual for Construction and Supervision of Bituminous Works.

Transporting:

Bituminous material shall be transported in clean insulated vehicles, and unless otherwise agreed by the Engineer, shall be covered while in transit or awaiting tipping. Subject to the approval of the Engineer, a thin coating of diesel or lubricating oil may be applied to the interior of the vehicle to prevent sticking and to facilitate discharge of the material.

Spreading:

Except in areas where a mechanical paver cannot access, bituminous materials shall be spread, leveled and tamped by an approved self-propelled paving machine. As soon as possible after arrival at site, the materials shall be supplied continuously to the paver and laid without delay.

The rate of delivery of material to the paver shall be regulated to enable the paver to operate continuously. The travel rate of the paver, and its method of operations, shall be adjusted to ensure an even and uniform flow of bituminous materials across the screed, free from dragging, tearing and segregation of the material. In areas with restricted space where mechanical paver cannot be used, the materials shall be spread, raked and leveled with suitable hand tools by experienced staff, and compacted to the satisfaction of the Engineer.

The minimum thickness of material laid in each paver pass shall be in accordance with the minimum values given in the relevant parts of this Specification. When laying binder course or wearing course approaching and expansion joint of structure, machine laying shall stop 300 mm. short of the joint.

The remainder of the pavement up to the joint, and the corresponding area beyond it, shall be laid by hand, the joint or joint cavity shall be kept clear of surface material.

Bituminous material, with a temperature greater than 145°C, shall not be laid or deposited on bridge deck waterproofing system, unless precautions against heat damage have been approved by the Engineer.

Hand placing of pre-mixed bituminous material shall only be permitted in the following circumstances:

- (i) For laying regulating course of irregular shape and varying thickness.
- (ii) In confined space where it is impracticable for a paver to operate.
- (iii) For footways.
- (iv) At the approaches to expansion joints at bridges, viaducts, or other structures.
- (v) For laying mastic asphalt in accordance with Clause 515 of MORT & H.
- (vi) For filling of potholes.
- (vii) Where directed by the Engineer.

Manual spreading of pre-mixed wearing course material or the addition of such material by hand spreading the paved area, for adjustment of level, shall only be permitted in the following circumstances:

- (i) At the edges of the layers of material and at gullies and manholes.
- (ii) At the approaches to expansion joints at bridges, viaducts or other structures. As directed by the Engineer.

Bitumen Penetration	Bitumen Mixing (OC)	Aggregate Mixed Mixing (OC)	Rolling Laying		
			Mixing (OC)	Mixing (OC)	Mixing (OC)
35	160 – 170	160 – 175 170	100	130	
			Maximum	Minimum	Minimum
		150 – 175			
65	150 – 165	165	90	125	
			Maximum	Minimum	Minimum
		140 – 165			
90	140 – 160	155	80	115	
			Maximum	Minimum	Minimum

Compaction:

After the spreading of mix, rolling shall be done by 80 to 100 kN vibratory roller. Rolling shall start as soon as possible after the material has been spread deploying a set of rollers as the rolling is to be completed in limited time frame. The roller shall move at a speed not more than 6 km. / h. Rolling shall be done with care to avoid unduly roughening of the pavement surface.

Rolling of the longitudinal joint shall be done immediately behind the paving operation. After this, the rolling shall commence at the edges and progress

towards the centre longitudinally except that on super elevated and uni-direction cambered portion, it shall progress from the lower to the upper edge parallel to the centre line of the pavement.

The initial or break down rolling shall be done with 80 – 100 kN static weight smooth wheel roller (3 wheelers or tandem), as soon as it is possible to roll the mix without cracking the surface or having the mix pick up on the roller wheel. The second or intermediate rolling shall follow the break down rolling with vibratory roller of 80 to 100 kN static weight or pneumatic typed roller of 150 to 250 kN weight, with minimum 7 wheels and minimum tyre pressure of 0.7 MPa as closely as possible to the paver and be done while the paving mix is still at a temperature than will result in maximum density. The final rolling shall be done while material is still workable enough for removal of roller marks with 60 – 80 kN tandem roller. During the final rolling vibratory system shall be switched off. The joints and edges shall be rolled with a 80 to 100 kN static roller.

When the roller has passed over the whole area once, any high spots or depressions which become apparent shall be corrected by removing or adding mix material. The rolling shall then be continued till the entire surface has been rolled to 95 per cent of the average laboratory density (obtained from Marshall Specimens compacted as defined in Table 500-100) there is no crushing of aggregates and all roller marks have been eliminated. Each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. The roller wheel shall be kept damp if necessary to avoid bituminous material from sticking to the wheels and being picked up. In no case shall fuel, lubricating oil be used for this purpose, nor excessive water poured on the wheels.

Rolling operations shall be complete every respect before the temperature of the mix falls below 100 degree C.

Roller (s) shall not stand on newly laid material while there is a risk that surface will be deformed thereby. The edges along and transverse of the bituminous grout laid and compacted earlier shall be cut to their full depth so as to expose fresh surface which shall be painted with a thin surface coat of appropriate binder before the new mix is placed against it.

Joints:

Where longitudinal joints are made in pre-mixed bituminous materials, the materials shall be fully compacted and the joint made flush in one of the following ways, only method (iii) shall be used for transverse joints:

(i) By heating the joints with an approved joint heater when the adjacent width is being laid, but without cutting back or coating with binder. The heater shall

raise the temperature of the full depth of material, to within the specified range of minimum rolling temperature and maximum temperature at any stage for the material, for a width not less than 75 mm. The Contractor shall have equipment available, for use in the event of a heater breakdown, to from joints by method (iii), (ii) by using two or more pavers operating in echelon, where this is practicable and in sufficient proximity for adjacent width to be fully compacted by continuous rolling.

(iii) by cutting back the exposed joints, for a distance equal to the specified layer thickness, to a vertical face, discarding all loosened material and coating the vertical face completely with 80 / 100 penetration grade hot bitumen, or cold applied bitumen, or polymer modified adhesive bitumen tape with a minimum thickness of 2 mm. before the adjacent width is laid.

All joints shall be offset at least 300 mm. from parallel joints in the layer beneath or as directed, and in layout approved by the Engineer. Joints in the wearing course shall coincide with either the lane edge or the land marking, whichever is appropriate. Longitudinal joints shall not be situated in wheel track zones.

Rolling shall be continued until the specified density is achieved, or where no density is specified, until there is not further movement under the roller. The required frequency of testing is defined in Clause 903 of MORT & H.

Surface Finish and Quality Control of Work:

The surface finish of the complete construction shall conform to the requirements of Clause 902 of MORT & H. For control of the quality of material supplied and works carried out, the relevant provision of Section 900 to MORT & H shall apply.

Protection of layer:

The bituminous macadam shall be cover with either the next pavement course or wearing course, as the case may be within a maximum of forty-eight hours. If there is to be any delay, the course shall be cover by a seal coat to the requirement of Clause 513 of MORT & H. before opening to any traffic. The seal coat in such cases shall be considered incidental to the work and shall not be paid for separately.

Arrange of Traffic:

During the period of construction, arrangement of traffic shall be made in accordance with the provisions of Clause 112 & MORT & H.

Measurements for Payment:

Bituminous macadam shall be measured by weight in metric tones, where used as regulating course, shown on the drawings, or as otherwise by the Engineer.

Rate:

The contract unit rate for the bituminous material shall be payment in full for carrying out the required operations including full compensation for, but not necessarily limited to:

- (a) Making arrangements for traffic to Clause 112 of MORT & H except for initial treatment to verge, shoulders and construction of diversions.
- (b) Preparation of the surface to receive the material.
- (c) Providing all materials to be incorporated in the work including arrangement for stock yard, *all royalties, fees, rents where necessary and all leads and lifts.
- (d) Mixing transporting, laying and compacting the mix as specified.
- (e) All labour, tools, equipment, plant including installation of Drum Mix Plan, power supply units and all machineries, incidental to complete the work to these Specifications.
- (f) Carrying out the work in part width of the road where directed.
- (g) Carrying out all tests for control of quality, and
- (h) The rate shall cover the provision of bitumen at the rate specified in the contract, with the provision that the variation in actual percentage of bitumen used will be assessed and the payment adjusted accordingly.
- (i) The rates for premixed material are to include for all wastage in cutting of joints etc.
- (j) The rates are to include for all necessary testing, mix design transporting and testing of samples, and cores. If there is not a project specific laboratory, the Contractor must arrange to carry out all necessary testing at an outside laboratory, approved by the Engineer, and all costs incurred are deemed to be included in the rate quoted for the material.
- (k) The cost of all plant and laying trials as specified to proved the mixing and laying methods deemed to be included in the Contractor's rates for the materials.
- (L) The payment shall be made on 1 M.T. basis.

ITEM NO. 8: PROVIDING AND LAYING 25MM THICK SEMI DENCE BITUMENOUS CONCRETE USING BLACK CRUSHED STONE AGGREGATE AND FILLER MATERIALS AS PER GRADATION OF M.O.R.T & H. SPECIFICATION INCLUDING USING BITUMEN OF 60-70 GRADE OF MIXING AT THE RATE OF 50.00 KG/M.T. BY WEIGHT OF TOTAL MIX (I.E. 5.00%) AND MIXING THE AGGREGATE AND BITUMEN BY CONTINUOUS DRUM MIX PLANT AND SPREADING THE SAME BY PAVER FINISHER AND CONSOLIDATOIN BY VIBRATORY ROLLER INCLUDING COST OF ALL MATERIALS, FUEL, LABOURS, TOOLS AND PLANTS, USING CONTRACTOR'S OWN MACHINERIES.

Scope

This clause specifies the construction of Semi Dense Bituminous Concrete, for use in wearing / binder and profile corrective courses. This work shall consist of construction in a single layer of semi dense bituminous concrete on a previously prepared bituminous bound surface. A single layer shall be 25 mm. in thickness.

Materials

Bitumen: The Bitumen shall be 60/70 paving bitumen of Penetration grade complying with Indian Standard Specification for Paving Bitumen, IS : 73 and of the penetration indicated in Table 500-15, for semi dense bituminous concrete, or this bitumen as modified by one of the methods specified in Clause 521, or as otherwise specified in the Contract. Guidance on the selection of an appropriate grade of bitumen is given in the Manual for construction and Supervision of Bituminous Works.

Coarse aggregates: The coarse aggregates shall be generally as specified in Clause 507.2.2 except that the aggregates shall satisfy the physical requirements of Table 500-14.

Fine aggregates: The fine aggregates shall be all as specified in Clause 507.2.3

Filler: Filler shall be generally as specified in Clause 507.2.4

Where the aggregates fail to meet the requirements of the water sensitivity test in Table 500-14 then 2 per cent by total weight of aggregate, of hydrated lime shall be added without additional cost.

Aggregate grading and binder content : When tested in accordance with IS : 2386 Part-1 (Wet sieving method), the combined grading of the coarse and fine

aggregates and added filler shall fall within the limits shown in Table 500-1-5 for gratings' 1 to 2 as specified in the Contract.

Mixture Design

Requirements for the mixtures:

Apart from conformity with the grading and quality requirements for individual ingredients the mixture shall meet the requirements set out in Table 500-16.

TABLE 500-14.

**PHYSICAL REQUIREMENTS FOR COARSE AGGREGATE FOR SEMI DANSE
BITUMINOUS CONCRETE PAVEMENT LAYERS**

Property	Test	Specification
Cleanliness (Dust)	Grain size analysis	Max. 5% passing 0.075 mm. sieve.
Particle shape	Flakiness and Elongation Index (Combined)	Max. 30%
Strength	Los Angeles Abrasions value. Aggregate Impact value.	Max. 35% Max. 27%
Polishing	Polished Stone Value	Min. 55%
Durability	Soundness	
	Sodium Sulphate	Max. 12%
	Magnesium Sulphate	Max. 18%
Water Absorption	Water Absorption	Max. 2%
Stripping	Coating and Stripping of Bitumen Aggregate Mixtures	Minimum Retained coating 95%
Water Sensitivity	Retained Tensile Strength	Min. 80%

Note : 1) IS : 2386 Part I 6) IS : 2386 Pat-5

2) IS : 2386 Part I 7) IS : 2386 Part-3

(The elongation test may be done only non flaky aggregates in the sample)

3) IS : 2386 Part 4* 8) AASHTO T 283**

4) IS : 2386 Part 4* 9) IS : 6241

5) BS : 812 Part 114

* Aggregate may satisfy requirement of either of these two tests.

** The water sensitivity test is only required if the minimum retained coating in the stripping test is less than 95%.

The requirements for minimum percent voids in mineral aggregate (VMA) are set out in Table 500-12.

Binder Content:

The binder content shall be optimized to achieve the requirement of the mixture set out in Table 500-16 and the traffic volume as specified in the Contract. The Marshal method for determining the optimum binder content shall be adopted as described in the Asphalt institute Manual MS-2, replacing the aggregates retained on the 26.5 mm. sieve and retained on the 22.4 mm. sieve, where approved by the Engineer.

TABLE 500-15.

COMPOSITION OF SEMI DENSE BITUMINOUS CONCRETE PAVEMENT LAYERS

Grading	2
Nominal aggregate size	10 mm.
Layer thickness	25 – 30 mm.
IS Sieve (mm.)	Cumulative % by weight of total aggregate passing.
13.2	100
9.5	90 -100
4.75	35 -51
2.36	24 – 39
1.18	15 – 30
0.3	9 – 19
0.075	3 – 8
Bitumen content % by of total mix	Min. 5.0
Bitumen grade (pen)	80-100

Note:

1. The combined aggregate grading shall not vary from the low limit on one sieve to the high limit on the adjacent sieve.
2. Determined by the Marshall method.

TABLE 500-16.

REQUIREMENTS FOR SEMI DENSE BITUMINOUS PAVEMENT LAYERS

Minimum stability C) (kN at 600	8.2
Minimum flow (mm.)	2
Maximum flow (mm.)	4
Compaction level (Number of blows)	75 blows on each of the two faces of the

	specimen
Per cent air voids	3 – 5
Per cent voids in mineral aggregate (VMA)	See Table 500 – 12
Per cent voids filled with bituemen (VFB)	65 – 78

Plant trials – Permissible variation in job mix formula:

The requirements for plant trials shall be alt as specified in Clause 507.304, and permissible limits for variation as shown in Table 500-13.

Laying trials: The requirements for laying trials shall be all as specified in Clause 507.3.5.

Construction Operations:

Weather and Seasonal limitations: The provision of Clause 501.5.1 shall apply.

Preparation of base:

The surface on which the Semi Dense Bituminous material is to be laid shall be prepared in accordance with Clauses 501 and 902 as appropriate, or as directed by the Engineer. The surface shall be thoroughly swept clean by mechanical broom and dust removed by compressed air. In locations where a mechanical broom cannot access, other approved methods shall be used as directed by the Engineer.

Geosynthetic:

Where Geosynthetic are specified in the, Contract this shall be in accordance with the requirements stated in Clause 703.

Stress absorbing layer:

Where a stress absorbing layer is specified in the Contract, this shall be applied in accordance with the requirements of Clause 522.

Mixing and transportation of the mixture:

The provision as specified in Clauses 501.3 and 501.4 shall apply.

Spreading: The general provisions of Clauses 501.5.3 and 501.5.4 shall apply

Rolling: After the spreading of mix, rolling shall be done by 80 to 100 kN vibratory roller.

Rolling shall start as soon as possible after the material has been spread deploying a set of rollers as the rolling is to be completed in limited time frame. The roller shall move at a speed not more than 6 km. / h. Rolling shall be done with care to avoid unduly roughening of the pavement surface.

Rolling of the longitudinal joint shall be done immediately behind the paving operation. After this, the rolling shall commence at the edges and progress towards the centre longitudinally except that on super elevated and uni-direction cambered portion, it shall progress from the lower to the upper edge parallel to the centre line of the pavement.

The initial or break down rolling shall be done with 80 – 100 kN static weight smooth wheel roller (3 wheelers or tandem), as soon as it is possible to roll the mix without cracking the surface or having the mix pick up on the roller wheel. The second or intermediate rolling shall follow the break down rolling with vibratory roller of 80 to 100 kN static weight or pneumatic typed roller of 150 to 250 kN weight, with minimum 7 wheels and minimum tyre pressure of 0.7 MPa as closely as possible to the paver and be done while the paving mix is still at a temperature that will result in maximum density. The final rolling shall be done while material is still workable enough for removal of roller marks with 60 – 80 kN tandem roller. During the final rolling vibratory system shall be switched off. The joints and edges shall be rolled with a 80 to 100 kN static roller.

When the roller has passed over the whole area once, any high spots or depressions which become apparent shall be corrected by removing or adding mix material. The rolling shall then be continued till the entire surface has been rolled to 95 per cent of the average laboratory density (obtained from Marshall Specimens compacted as defined in Table 500-100) there is no crushing of aggregates and all roller marks have been eliminated. Each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. The roller wheel shall be kept damp if necessary to avoid bituminous material from sticking to the wheels and being picked up. In no case shall fuel, lubricating oil be used for this purpose, nor excessive water poured on the wheels.

Rolling operations shall be complete every respect before the temperature of the mix falls below 100 degree C.

Roller (s) shall not stand on newly laid material while there is a risk that surface will be deformed thereby. The edges along and transverse of the bituminous grout laid and compacted earlier shall be cut to their full depth so as to expose fresh surface which shall be painted with a thin surface coat of appropriate binder before the new mix is placed against it.

Opening to Traffic: The newly laid surface shall not be open to traffic for at least 24 hours after laying and the completion of compaction, without the express approval of the Engineer in writing.

Surface Finish and Quality Control

The surface finish of the completed construction shall conform to the requirements of Clause 902. All materials and workmanship shall comply with the provisions set out in section 900 of this Specification.

Arrangements for Traffic: During the period of constructions, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

Measurement for payment: The measurements shall be all as specified in Clause 507.8.

Rate: The Contract unit rate shall be all as specified Clause 507.9, except that the rate shall include the provision of bitumen at 5.00 per cent, by weight of total mixture. The variance in actual percentage of bitumen used will be assessed and the payment adjusted up or down accordingly.

The payment shall be made on 1 M.T. basis

ITEM NO. 9: PROVIDING AND LAYING ASPHALT PAINTING (VG-30 GRADE) ON B.T SURFACE USING BULK ASPHALT @ 5.00 KG/10 SQM & SPREADING STONE DUST @0.03 CUM/10 SQM ON PAINTED SURFACE INCLUDING COST OF ASPHALT & STONE DUST & ALL LABOUR WORK INCL. ROLLING WITH PTR ROLLER ETC COMPLETE.

The work shall consist of the application of a single coat of 60-70 bituminous material to an existing bituminous road surface specified in the Contract or instructed by the Engineer.

Bitumen:

The bitumen used for painting shall be 60-70 Grade bitumen complying with IS 73 or a type and grade as specified in the Contractor or as directed by the Engineer.

Weather and seasonal Limitations:

Bituminous material shall not be applied to a wet surface or during a dust storm or when the weather is foggy, rainy or windy or when the temperature in the shade is less than 100C.

Equipment:

The painting work shall be self propelled or towed bitumen pressure sprayer, equipped for spraying the material uniformly at a specified rate. Hand spraying of small areas, inaccessible to the distributor, or in narrow strips shall be sprayed with a pressure hand sprayer, or as directed by the Engineer.

Preparation of base:

The surface on which the painting is to be applied shall be cleaned and free from dust, dirt, and any extraneous material, and to be otherwise prepare in accordance with the requirements of Clauses 501.8 and 902 of MORT & H as appropriate. Immediately before the application of the bitumen, the surface shall be swept clean with a mechanical broom, and high-pressure air jet, or by other means as directed by the Engineer.

Application of painting:

The application of painting shall be at the rate specified in the Contract, and shall be applied uniformly. If rate of application of painting is not specified in the contract then it shall be at the rate specified in Table 500-2. The method of application of the tack coat will depend on the type of equipment to be used, size of nozzles, pressure at the spray bar, and speed of forward movement. The contractor shall demonstrate at a spraying trial, that the equipment and method to be used is capable of producing a uniform spray, within the tolerances specified. Where the materials to receive an overlay is freshly laid bituminous layer, that has not been subjected to traffic, or contaminated by dust, a tack coat is not mandatory where the overlay is complete within two days. Work should be planned so that no more than the necessary painting for the day's operation is placed on the surface.

Type of Surface	Quantity of liquid bituminous Material in Kg. per Sq.m. area
i) Normal bituminous surfaces	5Kg/10Sqm

Curing:

The painting shall be applied just ahead of the oncoming process. The bitumen shall be left to cure until all the volatiles evaporated before any subsequent construction is started. No plant or vehicles shall be allowed on the tack coat other than those essential for the construction.

Quality control of work:

For control of the quality of materials supplied and the works carried out, the relevant provision of section 900 of MORT & H shall apply.

Rolling:

Rolling work shall be carried out with PTR roller. Rolling shall be done as per detailed specification as described in above items of paver works.

Stone dust:

The stone dust shall be spread at the rate of 0.03 cum / 10 Sqm. as specified in the item. The spreading work shall be carried out as per the item No.18 page no.30 of the general technical specification for road works book-let.

Measurement for payment:

The measurements shall be all as specified in Clause 507.8.

The rate includes all the cost of materials and labours involved to complete the item.

The payment shall be made on 1 Sqm. basis

ITEM NO. 16: PROVIDING AND LAYING CEMENT CONCRETE 1:3:6 (1 CEMENT: 3 COARSE SANDS: 6 STONE AGGREGATE OF 40 MM NOMINAL SIZE) AND CURING COMPLETE EXCLUDING COST OF FORM WORK IN: (A) FOUNDATION AND PLINTH

1. In case of ordinary concrete, mix is not required to be designed by preliminary tests and proportions of cement, fine aggregates and coarse aggregates are specified by volume as given in table below for different Three grads designated as ordinary M.100: M.150: M.200 and M.250.
2. In the designation of a concrete mix. letter 'M' refers to the mix and the number to the specified 28 days works cube compressive strength of that mix on 150 mm cubes, expressed in kg. /cm.
3. The ordinary concrete mix shall generally be specified by volume. For cement which normally comes in bags and is used by weight, volume shall be worked out taking 50 kg. of cement as 0.035 cubic meter in volume. While measuring aggregate by volume, shaking, ramming or hammering shall not be done, proportioning of sand be as per its dry volume. In case it is damp allowance for bulking shall be made as per IS: 2386 (Part III).
4. In gradients required for ordinary concrete containing one 50 kg bag of cement for different proportions of mix shall be as given in Table below.

TABLE

Grade of Concrete	Mix by Volume	Total quantity of dry aggregate by volume per 50 kg cement to be taken as sum of individual volume of fine % coarse	Proportion of fine aggregate to coarse aggregate	Quantity of water per 50 kg of cement maximum
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aggregate maximum (1 cubic meter = 1000 Liters)				
1.	2.	3.	4.	5.
Ordinary M100	1:3:6	300	Generally, 1:2 for fine	34
Ordinary M150	1:2:4	220	aggregate to coarse	32
Ordinary M200	1:1.5:3	160	aggregate by volume but to	30
Ordinary M250	1:1:2	100	a upper limit of 1:1.5 and Limit of 1 :3	27

Note: The proportions of the aggregates shall be adjusted from upper limit to lower limit progressively as the grading of the final aggregate becomes finer and the maximum size of coarse aggregate becomes larger.

Example: For an average grading of fine aggregate (that is Zone II of IS: 383-1963) the proportions shall be 1:1 1/2:1:2 and 1:3 for maximum size of aggregates 10 mm, 20 mm and 40 mm respectively.

Note: K mix leaner than M 100 (1:3:6) may be used for nonstructural part, if provided in the contract. In such cases grading of aggregates shall be by volume. Other requirements for mixing, placing and curing shall be the same.

5. Following shall be the maximum nominal size of coarse aggregate for the different items of work.

- (i) Plain C.C. 63 mm
- (ii) Solid type piers, abutments and 40 mm wing walls, and their per caps. (Coarse aggregate of size up to 40 mm shall be machine crushed),
- (iii) C.C. Wearing Coat M-150 20mm
(Coarse aggregate of size up to 40 mm shall be machine crushed.)

6. Fine aggregate shall be clean, hard coarse sand. It shall be free from dust and such other substances. The sand shall be got approved by the Engineer in-charge.

7. All materials shall be stored as to prevent their deterioration or intrusion of their quality and fitness for the work. Any material which has deteriorated or has been damaged or is otherwise considered defective by the Engineer-in-charge shall not be used in the work.

8. Cement shall be stored above the ground level in perfectly dry and watertight sheds and 'shall be stocked not more than eight, bags high. Wherever bulk storage containers are used, their capacity should be

sufficient to cater to the requirements at site and should be cleaned at least once every 3 to 4 months. Cement more than 3 to 4 months old shall invariably be tested to ascertain that it satisfies the acceptability requirements. The aggregates shall be stored in such a way as to prevent admixture of foreign materials. Different sizes of fine or coarse aggregate shall be stored in separate stock piles sufficiently removed from each other to prevent inter mixing the materials at edges of the pipes.,

9. The water for mixing shall be potable water to the satisfaction of the Engineer-in-charge. The quantity of water shall be just sufficient to produce a dense concrete of required workability for the job,
10. For all work, concrete shall be mixed in a mechanical mixer along with other accessories shall be kept in first class working condition and so maintained throughout the construction. Mixing shall be continued till materials are uniformly distributed and an uniform colour of the entire mass is obtained and each individual particles of the coarse aggregate shows complete coating of mortar containing its proportionate amount of cement.

In no case shall the mixing be done for less than 2 minutes after all ingredients have been put into the mixer.

11. When hand mixing is permitted by the Engineer-in-charge for small jobs or for certain other reasons, it shall be done on a smooth watertight platform large enough to allow efficient turning over of the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign material shall get mixed with concrete nor does the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate, which shall also be spread in a layer of uniform thickness on the mixing platform. Dry coarse" and fine aggregate and cement. Then shall be mixed thoroughly by turning over to mass turned over till a mix of required consistency is obtained. In hand mixing quantity of cement shall be increased by 10 percent above that specified.
12. Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before putting in a new batch. Unless otherwise agreed to by the Engineer-in-charge the first batch of concrete from the mixer shall contain only two third of normal quantity of coarse aggregate. Mixing plants shall be thoroughly cleaned before changing from one type of cement to another.
13. The method of transporting and placing concrete shall be approved by the Engineer-in-charge Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent material takes place. All form work and reinforcement contained in it shall be cleaned and made free from standing water, dust snow or ice immediately before placing of

concrete. No concrete shall be placed in any part of the structure until the approval of the Engineer-in-charge has been obtained.

If concreting is not started with 24 hours of the approval being given, it shall have to be obtained again from the Engineer-in-charge. Concreting then shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer unless carried in properly designed agitators, operating continuously, when this time shall be within 2 hours of the addition of cement to the mix and within 30 minutes of its discharge from the agitator. Except where otherwise agreed to by the Engineer-in-charge, concrete shall be disposed in horizontal layer to a compacted depth of not more than 0.45 meter when internal vibrators are used and not exceeding 0.30 meter in all other cases.

15. Unless otherwise agreed to by the Engineer-in-charge. Concrete shall not be dropped into place from a height exceeding 2 meters. When trucking or chutes are used, they shall be kept clean and used in such way as to avoid segregation. When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept clean, thoroughly wetted, and cleaned with a 13mm. thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13 mm layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, all laitance shall be removed by scrubbing the new surface with wire or bristle brushed. Care being taken to avoid dislodgement of particulars of coarse aggregate. The surface shall then be thoroughly wetted, all free water removed and then coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150 mm. in thickness, and shall be well rammed against old work particular attention being given to corner and close spots.
16. All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators, unless otherwise permitted by the Engineer-in-charge for exceptional cases, such as concreting under water, where vibrator cannot be used sufficient vibrators in serviceable condition shall be kept at site so that spare equipments is always available in the event of break downs.
17. Immediately after compaction, concrete shall be protected against harmful effects of weather, including rain, running water, shocks, vibrations due to traffic, rapid temperature changes, fast drying put process. It shall be covered with wet sacking hessian or other similar obsorbent material approved by the Engineer-in-charge soon after the initial set. It shall be kept continuously wet for a period of not less than 14 days from the date of

placement. Masonry work over the foundation concrete may be started after 48 hours of its laying but the curing of concrete shall be continued for a minimum period of 14 days.

18. Form work shall include all temporary or permanent forms required for forming the concrete, together with all temporary construction required for their support. Forms for concrete shall be constructed of metal or timber suitably lined and be of substantial and rigid construction true to shape and dimensions shown on the drawings. Where metal forms are used, all bolts and rivets shall be counter sunk and well ground to provided a smooth, plain surface. Where timber is used it shall be well seasoned, free from loose knots, projecting nails, splits or other defects that may mark the cement surface of concrete. For exposed concrete faces, timber for shuttering shall be wrought on all faces in contact with concrete.
19. Forms shall be mortar tight and shall be made sufficiently rigid by the use of ties and bracings to prevent any displacement or sagging between supports. They shall be strong enough to withstand all pressure, ramming and vibration, without deflection from the prescribed lines occurring during and after placing the concrete. Screw jacks or hardwood wedges where required shall be provided to make up any settlement in the form work either before or during the placing of concrete. Suitable camber shall be provided in horizontal members of surface especially in long spans to counteract the effects of any deflection. The frame work shall be so fixed as to provide for such camber. Forms shall be so constructed as to be removable in sections in the desired sequence, without damaging the surface of concrete or disturbing other sections. Unless otherwise specified or directed. Chamfers or fillets of size 25 mm x 25 mm shall be provided at all angles off ram work to avoid sharp corners.
20. The inside surface of forms shall, except in the case of permanent form work or where otherwise agreed to by the Engineer-in-charge. be coated with an approved material to prevent adhesion of concrete to the form work. Release agents shall be applied strictly in accordance with the manufacturer's instructions and shall not be allowed to come into contact with any reinforcement of pre-stressing tendons and anchorage. Different release agents shall not be used in form work of concrete which will be visible in the finished works.
21. Special measures shall be taken to ensure that the framework does not hinder the shrinkage of concrete because without these cracking could occur before the form work is removed Where applicable arrangements must be made to ensure that the form does not restrain the shortening and hogging of the beams of slabs during tensioning of the tendons. The formwork should take due account of the calculated amount at positive or negative camber so as to ensure the correct final shape of the structures having regard to the deformation of false work, scaffolding or propping and

the instantaneous deformation due to various causes affecting prestressed structures. Where there are re-entrant angles in the concrete sections, the formwork should be removed at these sections as soon as possible after the concrete has set in order to avoid cracking due to shrinking of concrete. Formwork shall be tight enough to prevent any appreciable loss of cement during vibrations. Suitable tolerances should be provided in the formwork, immediately before concreting all forms shall be thoroughly cleaned Contractor shall give the Engineer-in-charge due notice before placing any concrete in the forms to permit him to inspect and accept the false work and forms as to their strength alignment and general fitness, but such inspection shall not relieve the contractor of his responsibility for safety of machinery, materials and for results obtained.

22. The Engineer-in-charge shall be informed in advance by the contractor of his intention to strike any formwork. While fixing the time for removal of formworks, due consideration shall be given to local conditions, character of the structure, the weather and other conditions that influence the setting of concrete the removal of the load supporting or soffit forms may commence when concrete has attained strength and of the materials used in the ix. Where field operations are controlled by the strength test of concrete, the removal. of the load supporting or soffit forms may commence when concrete has attained strength equal to at least! twice the stress to which the concrete will be subject at the time of striking props including the effect of any further addition of loads, when field operations are not controlled by strength tests of concrete the vertical forms of beams, columns and walls may be removed after 2 days. The props of slabs and beams may be removed after 14 and 21 days respectively. All form work shall be removed without causing any damage to the concrete. Centering shall be gradually and uniformly lowered in such a manner as to avoid any stock or vibrations. Supports shall be removed in such a manner as to permit the contract the concrete to take stresses due to its own weight uniformly and gradually. Where internal metal ties are permitted, they or their removable parts shall be extracted without causing any damage to the concrete and remaining holes filled with mortars. No permanently embedded metal part shall have less then 25mm. cover to the finished concrete surface. Where it is intended to reuse the formwork, it shall be cleaned and made good to the satisfaction of the Engineer-in-charge.
23. Immediately after the removal of forms, all exposed bars or bolts passing through the Cement Concrete member and used for shuttering or any other purpose shall be cut inside the Cement Concrete member to a depth of at least 25 mm. below the surface of the concrete and the resulting holes filled by cement mortar. All fins cause by form joints, all cavities produced by the removal of form ties and all other holes and depressions, honeycomb spots, broken edges or corners and other defects, shall be

thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar of cement and fine aggregate mixed in the proportions used in the grade of concrete that is being finished and of as dry a consistency as is possible to use. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surface which has been pointed shall be kept moist for a period of 24 hours. If rock, pockets/honeycombs, in the opinion of the Engineer-in-charge are of such an extent of and character as to affect structure materially or to endanger the life of the strength of the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the portions of the structure affected. Joint shall be filled up with bitumen as directed by Engineer-in-charge in case of C.C. wearing surface.

24. The unit rate for concrete shall include the cost of all materials, labour, tools and plants required for mixing, placing in positions, vibrating and compacting, finishing as per directions of the Engineer-in-charge, curing and all other incidental expenses for producing concrete of specified strength to complete the structure or its components as shown in the drawings and according to these specifications, The rate shall also include the cost of making, fixing and removing of all centering and forms required for the work centering.
25. The payment will be made on cum basis of the finished work.

GENERAL SPECIFICATIONS FOR PLAIN, REINFORCED AND PRE-STRESSED CONCRETE

1. GENERAL

These specifications cover the requirements of plain, reinforced and pre-stressed concrete for use in various components of structures.

For all items of concrete in any portion of the structure or its associated works-controlled concrete shall be used unless otherwise specified. Normal /ordinary concrete mix as shown on the drawing or as directed by the Engineer-in-charge may be used. The provisions of the latest revisions of the following I.S Codes shall form a part of this specification to the extent they are relevant.

IS-226:	Specification for structural steel (standard quality).
IS-269:	Specification for ordinary and low heat Portland cement
IS-280:	Specification for mild steel wire for general engineering purpose.
IS-303:	Plywood for general purposes.
IS-383:	Specification for coarse and fine aggregate.
IS-432(All Parts):	Specifications for mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement. Part-I – Mild steel and medium tensile bars Part-II – Hard drawn steel wire

IS-455:	Specification for Portland blast furnace slag cement.
IS-456: (IS: 456-2000)	Code of practice for plain and reinforced concrete.
IS-460:	Specification for test sieves.
IS-516:	Methods of test for strength of concrete.
IS-650:	Standard sand for testing of cement.
IS-1139:	Hot rolled mild steel, medium tensile steel and HYSD bars for concrete reinforcement.
IS-1199:	Sampling and analysis of concrete.
IS-1200:	Method of measurement of building works.
IS-1489:	Specification for Portland pozzolana cement.
IS-1542:	Sand for plaster.
IS-1566:	Specification for hard-drawn steel wire fabric.
IS-1732:	Dimensions for round & square steel bars for structural & general engineering purposes.
IS-1786:	Specification for high strength deformed steel bars & wires for concrete reinforcement.
IS-1791:	Batch type concrete mixers.
IS-2062:	Specification for structural steel (fusion welding quality)
IS-2386(All Parts):	Method of test for aggregates for concrete.
IS-2502:	Code of practice for bending and fixing of bars for concrete reinforcement
IS-2505:	Immersion type concrete vibrators.
IS-2506:	Screed board concrete vibrators.
IS-2722:	Specification for portable swing weighs batcher (single and double bucket type).
IS-2751:	Code of practice for welding of M.S. bars.
IS-3366:	Pan vibrators
IS-3370(All Parts):	Code of practice for concrete structure for the storage of liquids.
IS-3558:	Code of practice for the use of immersion vibrators for consolidating concrete.
IS-4656:	Form vibrators for concrete.
IS-5525:	Recommendation for detailing of reinforcement in reinforced concrete works.
IS-5640:	Method of test for determining aggregate impact value of soft, coarse aggregate.
IS-5816:	Method of test for splitting tensile strength of concrete cylinder.
IS-6461:	Cement concrete: glossary of terms.
IS-8041:	Specifications for rapid hardening Portland cement.
IS-8043:	Specifications for hydrophobic Portland cement.
IS-8112:	Specifications for high strength ordinary Portland cement.
IS-9103:	Admixtures for concrete.

IS-12269:	Specifications for 53 grade Ordinary Portland cement.
IS-12330:	Specifications for Sulphate resistance Portland cement.
IS-12600:	Specifications for Low Heat Portland cement.
IS-14268:	Specifications for Uncoated stress relieved Low Relaxation Steel.

1.1 OTHER CODES AND SPECIFICATIONS

Other IS codes pertaining to the items of cement concrete work in structural work not listed above shall also be deemed to come under the purview of this clause. All Indian Roads Congress Standards, specifications and codes of practice also come under this purview.

2.0 GRADE OF CONCRETE:

2.1 CONTROLLED CONCRETE:

For controlled concrete, design of the mix shall be carried out for the respective target strength and in its production all necessary precautions shall be taken to ensure that the required works cube strength is attained and maintained.

The controlled concrete grades are designated as M20, M25, M30, M35, M40, M45 and M50 and as per the technology used for such designation in IRC codes of practice.

a. ORDINARY CONCRETE (Concrete Grades M15 & below):

In case of ordinary / nominal grade concrete, mix is required to be arrived at by preliminary tests, proportions of cement, fine aggregates and coarse aggregates are specified by mass as given in Table 3

In the designation of a concrete mix, letter 'M' refers to the mix and the number to the specified 28 days works cube compressive strength of that mix on 150mm² cubes, expressed in N/mm².

3.0 STRENGTH REQUIREMENT OF CONCRETE:

Where Ordinary Portland Cement conforming to IS:269 or Portland Blast Furnace Cement conforming to IS:456 is used, the compressive strength requirements for various grades of concrete controlled as well as nominal shall be as given in Table

1. Where rapid hardening Portland cement is used, the 28 days compressive strength requirements shall be met at 7 days.

For controlled concrete, the mix shall be so designed for the so called Target strength as to attain in preliminary tests strength at least 33 per cent higher than that required on work tests, for concrete strength up to and including M25 and 25% higher for higher strengths.

Table 1

Grade of Concrete	Compressive Works Test Strength in N/mm ² on 150mm Cubes after Testing Conducted in accordance with IS: 516	
	Min. at 7 days	Min. at 28 days
M15	10	15
M20	13.5	20
M25	17	25
M30	20	30
M35	23.5	35
M40	26.80	40

Note: In all cases, the 28 days compressive strength specified in Table 1 shall alone be the criterion for acceptance or rejection of the concrete.

4.0 MATERIALS: As per schedule-A of para 4.1 of General rules and directions

4.1 CEMENT

Fresh quality cement shall be procured only from approved manufacturer / supplier and shall be subjected to prior approval of the Engineer-in-Charge. Following types of cement shall be used:

- i) All cement used for the work shall be ordinary Portland cement or such other cement as may be permitted by the Engineer-in-charge. Portland cement shall comply with the requirements of the latest issue of IS: 269.

High alumina cement, rapid hardening cement and Portland slag cement etc. can be used only when permitted by the Engineer-in-charge. Such cements shall be in accordance with relevant IS Codes. Portland Pozzolana cement when permitted by the Engineer-in-charge shall confirm to IS 1489 Part I but it shall not be used for RCC structural member.

- ii) Cement which has remained in bulk storage at the mill for more than 6 months or which has remained in bags at the dealers storage for over 3 months, or which has been stored at project site for more than 3 months shall be retested before use. Cement shall also be rejected if it fails to confirm to any of the requirements of these specifications.
- iii) Different types of cements shall not be mixed.

4.2 FINE AGGREGATES:

Fine aggregates shall consist of natural sand, manufactured sand or an approved combination thereof and shall confirm to IS: 383. The grading zone of sand proposed for use shall be supplied by the contractor and got approved by the Engineer-in-Charge.

The sand shall be siliceous material, sharp, hard, strong and durable and shall be free from adherent coatings, clay, dust, alkali, organic material, deleterious matter, lumps, etc.

Either natural or manufactured sand shall be prepared for use by such screening or washing, or both, as necessary, to remove all objectionable foreign matter. Natural sand shall be washed, unless specific written authority is given by the Engineer-in-charge to use sand that meets specifications and standards of cleanliness without washing. The cost of screening and washing must be borne by the contractor. The fine aggregate shall be taken from a source approved by the Engineer-in-charge.

4.3 COARSE AGGREGATES:

Coarse aggregates shall consist of hard, strong, durable particles of crushed stone and shall be free from thin elongated soft pieces, organic or other deleterious matter. It will be from a source approved by the Engineer-in-charge. Coarse aggregate shall conform to IS: 383.

Coarse aggregate shall be washed if necessary to remove all vegetable and other perishable substances and objectionable amounts of other foreign matter, the cost of washing and screening being borne by the contractor.

Size of Coarse Aggregates

Following shall be the maximum nominal size of coarse aggregate for the different items of work if not specified in the item of works or their respective specifications:

Sr. No.	Item of Construction	Max. Nominal Size of Coarse Aggregate
(i)	RCC well staining concrete, RCC well curb & RCC piles in plum concrete	40 mm
(ii)	Well cap or pile cap, solid type piers, abutments and wing walls, and pier caps, footing of open foundation and general items of work in bridge and building construction.	25 /20 mm
(iii)	RCC works in girders, deck slab, wearing coat, Krebs, light posts, ballast walls, approach slab etc. and piers, abutments, returns, wing walls and retaining walls.	25 /20 mm
(iv)	RCC bearings, shells and other thin-walled members and in zones of congestion.	25 /20 mm

(v)	For any other item of construction not covered by items (I) to (iv)	As specified in the drawings or as desired by the Engineer-in-Charge in case it is not specified on the drawing.
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For heavily reinforced concrete members as in the case of ribs of main beams, the nominal maximum size of aggregate shall usually be restricted to 5mm less than the minimum lateral clear distance between the main bars, or 5mm less than the minimum cover to the reinforcement, whichever is smaller.

4.4 REINFORCING STEEL (Refer Clause 302.5 of IRC: 21)

Reinforcing steel shall be clean and free from loose mill scales, dust, loose rust and coats of paints, oil, grease or other coatings which may impair or reduce bond.

- Fe240 Mild steel shall conform to the latest edition of IS: 432 Part 1.
- Fe415 & Fe500 high strength deformed bars shall conform to IS: 1786, **TMT bars conforming to IS: 1786 shall only be used.**
- Structural steel sections and plates shall conform IS: 226 and IS: 2062.

4.5 WATER

Water used mixing and curing shall be free from injurious amounts of deleterious material. pH value of water shall not be less than 6. Potable water is generally considered satisfactory for mixing and curing concrete. Water shall be got tested before use in concrete and curing. The cost for the same shall be borne by the contractor. Permissible limits for solid shall be as below:

PERMISSIBLE LIMIT FOR SOLIDS

	Tested as per	Permissible limit max.
Organic	IS: 3025 (Pt.18)	200 mg/lit.
Inorganic	IS: 3025 (Pt. 18)	3000 mg/lit.
Sulphate (as SO ₃)	IS: 3025 (Pt. 28)	400 mg. /lit.
Chlorides (as Cl)	IS: 3025 (Pt. 32)	2000 mg. lit. for concrete work not containing embedded steel and 500 mg. /lit. for pre stressed /reinforced concrete work.
Suspended matter	IS: 3025 (Pt. 7)	2000 mg. /lit.

4.6 ADMIXTURES

No materials other than essential ingredients i.e. cement, aggregate and water shall ordinarily be used in the manufacture of concrete or mortar. But

the Engineer-in-Charge may permit the use of approved admixtures for improving the workability of the concrete, if so specified on satisfactory evidence that its use does not in any way adversely affect the properties of concrete particularly its strength, volume changes, durability and has no deleterious effect on the reinforcement. Admixture where allowed shall conform to relevant IS: 9103.

Chloride content in admixture shall be independently tested for each batch before acceptance. The compatibility of the admixture with cement being used in works shall invariably be got tested and confirmed prior to its use in permanent works.

4.7 MATERIALS FOR REPAIR WORK

The use of epoxy formulations for bonding fresh concrete used for repairs will be permitted on written approval of the Engineer-in-Charge. Epoxies shall be applied in accordance with the instructions of the Manufacturer. The cost of such repair when approved by the Engineer-in-Charge shall be borne by the contractor.

4.8 STORAGE OF MATERIALS

i) Cement

The contractor shall make arrangements to the satisfaction of the Engineer-in-Charge for the storage of cement to prevent deterioration due to moisture and/or intrusion of foreign matter. Bulk cement shall be stored in approved waterproof bin or silo. Bagged cement shall be stored in a suitable weather tight warehouse in a manner to provide easy access for identification and inspection of each consignment. Stored cement shall meet the test requirements as per relevant BIS code at any time after storage, when a retest is ordered by the Engineer-in-Charge. Each consignment shall be stacked separately with the date of receipt flagged on it, not more than 12 bags being stacked in height, the bags being arranged with headers and stretchers. Normally consignments shall be used in the order of receipt at site unless otherwise directed. In the case of large concrete pours the Engineer-in charge will decide on the batch of cement to be used taking into consideration the quantity of cement with particular reference to the concerned concrete pours. Any additional work in handling and storage of cement contingent upon this requirement shall be to the contractor's account and no extra claim will be entertained. Cement shall be protected from exposure to moisture in transit, in storage at the works and until it enters the concrete mixers. The contractor shall keep accurate records of the deliveries of the cement and of its use in the work.

ii) Aggregates

Coarse and fine aggregates shall be stacked separately in such manner as to prevent contamination by foreign materials. All aggregates shall be stored on concrete or masonry platforms. Each size shall be kept separate with wooden, steel, concrete, or masonry bulk heads, or shall be stored in separate stacks, taking care to prevent the materials at the edges of the stock piles from getting intermixed. Stacks of fine and coarse aggregates shall be kept sufficiently apart. The aggregates shall be stored in easily measurable stacks of suitable heights as may be directed by the Engineer-in-charge.

iii) Reinforcing Steel

Reinforcing steel shall not be stored directly on the ground. These shall be stored under cover and shall be protected from rusting, oil, grease and distortions as directed by the Engineer-in-Charge.

5.0 PROPORTIONING CONCRETE:

5.1 CONTROLLED CONCRETE:

Concrete mix shall be designed for 33% higher strength than the grade of concrete specified. The proportions for ingredients chosen shall be such that concrete has adequate workability for conditions prevailing on the work in question and can be properly compacted with the means available.

Except where it can be shown to the satisfaction of the Engineer-in-charge that a supply of properly graded aggregate of uniform quality can be maintained till the completion of work. Grading of aggregate should be strictly controlled. The different sizes shall be stocked in separate stock piles. Required quantity of material shall be stock-piled several hours, preferably a day, before use. Grading of coarse and fine aggregate shall be checked as frequently as possible, frequency for a given job being determined by the Engineer-in-charge to ensure that the suppliers are maintaining the uniform grading as approved for samples used in the design mix.

The quantity of both cement and aggregate shall be determined by weight. Water shall either be measured by volume in calibrated tanks or weighed. All measuring equipment shall be maintained in a clean and serviceable condition. Their accuracy shall be periodically checked.

It is most important to keep the specified water-cement ratio constant and at its correct value. To this end, the moisture content in both fine and coarse aggregates shall be determined by the Engineer-in-charge according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For the determination of moisture content in the aggregates, IS: 2386 (Part III) shall be referred to. Suitable adjustments shall also be made in the weights of aggregates to allow for the variation in weights of aggregates due to

variation in their moisture content.

The minimum cement and maximum water cement ratio and minimum grade of concrete is given below:

TABLE – A

Concrete Grade	Minimum	Maximum	Max. W/C Ratio
M20	310	325	0.55
M25	330	350	0.50
M30	350	375	0.45
M35	370	400	0.45
M40	400	450	0.45
M45	450	500	0.45

For concrete with volumetric / nominal mix and other items with use of cement the same shall be as per prevailing Surat Municipal Corporation standards.

Note:

- 1 The contractor shall have to carry out mix design with cement content for the relevant grade as per above table.
- 2 The contractor shall have to carry out the mix design, for the relevant grades keeping in view the maximum cement level (i.e as far as possible the cement level shall be between the minimum and maximum cement content, as above)
- 3 Contractor will be allowed to use any admixtures of approved quality to achieve required strength and workability and up to maximum cement content.
- 4 If the contractor submits the mix design for the cement content higher than the maximum cement content for execution (as indicated in Table A), the penalty @ Rs. **4600/-** per MT up to $\pm 5\%$ of total theoretical consumption and @ Rs. **9340/-** per MT for more than $\pm 5\%$ of the total theoretical consumption of relevant item/ grade of concrete actually executed at the site by Contractor shall be levied.

Limits of Chloride Content of Concrete

[Ref: Table 7 of IS: 456-2000]

Sr. No.	Type or Use of Concrete	Maximum Total Acid Soluble Chloride Content expressed as kg/m³ of Concrete
(1)	(2)	(3)
1	Concrete containing metal and steam cured at elevated temperature and	0.4

	pre stressed concrete	
2	Reinforced concrete or plain concrete containing embedded metal	0.6
3	Concrete not containing embedded metal or any material requiring protection from chloride	3.0

Condition of Exposure:

i) Severe -Marine Environment :

Alternate wetting and drying due to sea spray, alternate wetting and drying combined with seizing, buried in soil (having corrosive effect); members in contact with water where the velocity of flow and the bed material are likely to cause corrosion of concrete.

ii) Moderate -Condition other than 'severe'

- a) The minimum cement content is based on 20 mm size aggregates. For larger size aggregates, it may be reduced suitably by not more than 10%. Similarly for smaller size aggregates, it may be suitably increased, but not more than 10%.
- b) The cement content shall not exceed 540 kg/cum of concrete.

iii) Ordinary / Nominal Concrete:

The ordinary / nominal concrete mix shall also be specified by mass. Proportioning of sand shall be as per its dry volume and in case it is damp, allowance for 'bulking' shall be made as per IS: 2386 (Part III).

Ingredients required for nominal mix concrete containing one 50 Kg. bag of cement for different proportions of mix shall be as given in Table 2.

PROPORTION OF NOMINAL MIX CONCRETE

TABLE 2

Grade of Concrete	Total quantity of dry aggregates by mass per 50 Kg. of cement, to be taken as the sum of the individual masses of fine & coarse aggregates, (Kg.), Max.	Proportion of fine aggregate to-coarse aggregate by mass.	Qty. of water per 50 Kg. of cement Max. (Ltr.)
M7.5	625	Generally 1:2 for fine aggregate to coarse aggregate by volume but subject to a upper limit of 1:1	45
M10	480		34
M15	330		32

		½ and a lower limit 1.2 ½	
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Note No. 1:

The proportions of the aggregates shall be adjusted from upper limit to lower limit progressively as the grading of the fine aggregates becomes finer and the maximum size of coarse aggregate becomes larger.

Note No. 2:

The amount of water should be kept minimum required for proper workability. The quantity given in Col. 4 is not to be exceeded.

Example

For an average grading of fine aggregate (that is Zone II of IS:383-1963) the proportions shall be 1:1 ½ , 1:2 and 1:3, for maximum size of aggregates 10 mm, 20 mm and 40 mm respectively.

Note No. 3:

A mix leaner than M10 may be used for non-structural parts if specified on the drawing or provided in the contract. In such case grading of aggregates shall be as specified in the contract or on the drawings. Other requirements for mixing, placing and curing shall be the same as specified in this section.

iii) QUANTITY OF WATER

The quantity of water shall be just sufficient to produce a dense concrete of required workability and strength for the job. An accurate and strict control shall be kept on the quantity of mixing water. In the case of reinforced concrete work, workability shall be such that the concrete surrounds and properly grips, all reinforcements. The degree of consistency, which shall depend upon the nature of work and the methods of vibration of concrete, shall be determined by regular slump tests. The following slump shall be adopted for different types of works or as directed by the Engineer-in-charge.

Sr. No.	Type of Work	Where Vibrators are Used	Pump concrete
i)	Mass Concrete in RCC Foundations, Footings and Retaining Walls	25 mm to 40 mm	80 mm to 100 mm
ii)	Beams, Slabs & Columns Simply Reinforced	40 mm to 60 mm	100 mm to 120mm

iii)	Thin RCC Section or Section with Congested Steel	50 mm to 80 mm	120 mm to 150 mm
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Note:

- (i) With use of ordinary concrete the slump requirement specified above would not be applicable.
- (ii) The above referred slump shall be measured at pouring site & at pouring time (i.e. after 30/40 minutes after mixing water in concrete). The mix design shall have to be carried out accordingly.
- (iii) The contractor will be allowed to use plasticizer of approved quality to achieve required degree of workability. However, the cost of the plasticizer ad mixture shall have to be born by the contractor.

6.0 MIXING CONCRETE:

For manufacturing concrete, automatic mixer (mini/ mobile batching plant) with a minimum output capacity of 8cu.m per hour and having minimum/ single batching size of 0.35 cum with the production capacity of approximately 20 batches per hour shall only be used. There should be two automatic mixers including standby should be provided. The feeding of the concrete ingredients like sand, grit, aggregate and cement may be done manually, but gauges for that should be installed on it, either dial gauge or digital only. It should also have the same kind of arrangements for water flow and admixture dose on it or separately. All these gauges should be clearly identifiable, accessible and measurable from one place. The calibrations of all the gauges shall have to be done at least once a month or at the frequency as directed by Engineer-in-charge. All these accessories shall be mandatory and shall be kept in first class working conditions and so maintained throughout the construction. Mixing shall be continued till materials are uniformly distributed and a uniform colour of the entire mass is obtained and each individual particle of the coarse aggregate shows a complete coating of mortar containing its proportionate amount of cement.

In no case shall the mixing be done for less than 2 minutes after all ingredients have been put into the mixer.

Hand mixing of concrete is not permissible. Ordinary mixer machine may be permitted only under exceptional circumstances with the permission of the Engineer-in-charge in advance. In ordinary machine mixing, quantity of cement shall be increased by 10% above that specified above, but the cost of increased cement quantity shall be borne by the contractor. Mixers, which have been out of use for more than 30 minutes, shall be thoroughly cleaned before putting in a new batch. Unless otherwise agreed to by the Engineer-in-charge, the first batch of concrete from the mixer shall contain only two thirds of the nominal quantity of coarse aggregate. The mixing plant shall be thoroughly cleaned before changing from one type of cement

and/or mix to another. The machine mixing shall be permitted only under exceptional circumstances with the permission of the Engineer-in-charge in advance.

In case of concrete for piling automatic mobile mini batching plant of 8cu.m per hour capacity can be used as directed by Engineer-in-charge.

7.0 TRANSPORT, PLACING AND COMPACTION OF CONCRETE:

The method of transporting and placing concrete shall be as approved by the Engineer-in-charge. Concrete shall be transported and placed such that no contamination, segregation or loss of its constituent materials takes place.

All formwork and reinforcement contained in it shall be cleaned and made free from standing water or dust, immediately before placing of concrete.

No concrete shall be placed in any part of the structure until the approval of the Engineer-in-charge has been obtained in writing.

If concreting is not started within 24 hours of the approval being given, it shall have to be obtained again from the Engineer-in-charge. Concreting shall then proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless it is ensured that there vibration limit of the earlier concrete is not crossed or a proper construction joint is formed.

Concrete when deposited shall have a temperature of not less than 5 deg. C and not more than 40°C unless otherwise specified. It shall be compacted in its final position within 30 minutes of its discharge from the mixer unless carried in properly designed agitators, operating continuously, when this time shall be within 1 hour of the addition of cement to the mix and within 30 minutes of its discharge from the agitator, except where otherwise agreed to by the Engineer-in charge, concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 m when internal vibrators are used and not exceeding 0.30 m in all other cases.

Unless otherwise agreed to by the Engineer-in-charge, concrete shall not be dropped into place from a height exceeding 1.5meters. When trunking or chutes are used, they shall be kept clean and used in such a way as to avoid segregation.

When concrete is conveyed by chute, the plant shall be of such size and design as to ensure practically continuous flow. Slope of the chute shall be so adjusted that the concrete flows without the use of an excessive quantity of water and without any segregation of its ingredients. The delivery end of the chute shall be as close as possible to the point of deposit. The chute shall be thoroughly flushed with water before and after each working period and the water used for this purpose shall be discharged outside the

formwork.

When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept clean, thoroughly wetted and covered with a layer of neat cement grout. This shall be followed by a 10mm thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 10mm layer of mortar shall be freshly mixed and placed just before placing of new concrete.

Where concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgement of any particles of coarse aggregate. The surface shall then be thoroughly wetted, all free water removed, and then coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150mm in thickness, and shall be well rammed against old work, particular attention being given to comers and close spots.

All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators, unless otherwise permitted by the Engineer-in-charge for exceptional cases, such as concrete under water, where vibrators cannot be used. Sufficient vibrators, in serviceable condition, shall be kept at site so that spare equipment is always available in the event of breakdowns.

The performance requirements of vibrators shall conform to relevant IS Codes. Vibration shall not be applied through reinforcement, and where vibrators of the immersion type are used, contact with reinforcement and all inserts shall be avoided as far as practicable.

8.0 CONCRETING UNDER WATER:

When it is necessary to deposit concrete under water, the methods, equipment, materials and proportions of the mix to be used shall be got approved from the Engineer-in-charge before any work is started. Such concrete shall not be considered as 'Controlled Concrete'.

Concrete shall not be placed in water having temperature below 5°C. The temperature of the concrete, when deposited, shall be not less than 16°C, not more than 40°C.

While carrying out mix design, it shall be considered that concrete shall contain 10 per cent more cement than that required for the same mix placed in the dry. The materials shall be so proportioned as to produce a concrete having a slump of not less than 100mm and not more than 180mm. The slump shall be tested as per latest IS: 516.

Cofferdams or forms shall be sufficiently tight to ensure still water conditions if practicable, and in any case to reduce the flow of water to less than 3m per minute through the space into which concrete is to be

deposited. Cofferdams or forms in still water shall be sufficiently tight to prevent loss of mortar through the joints in the wells. Pumping shall not be done while concrete is being placed, or until 24 hours thereafter. It shall be ensured that freshly laid concrete is not subjected to any differential water head until it attains at least 50% of the characteristic strength.

Concrete shall be deposited continuously until it has been brought to the required height. While depositing, the top surface shall always be kept as nearly level as possible and formation of seams avoided. For depositing concrete any one of the following methods may be used:

a) Tremie

When concrete is to be deposited under water by means of tremie, the top section of the tremie shall be a hopper large enough to hold one full batch of the mix or the entire contents of the transporting bucket if any. The tremie pipe shall not be less than 200mm in diameter, and shall be large enough to allow a free flow of concrete and strong enough to withstand the external pressure of the water in which it is suspended, even if a partial vacuum develops inside the pipe. Preferably, flanged steel pipe of adequate strength for the job shall be used. A separate lifting device shall be provided for each tremie pipe with its hopper at the upper end. Unless the lower end of the pipe is equipped with an approved automatic check valve, the upper end of the pipe shall be plugged with a wadding of gunny sacking or other approved material before delivering the concrete to the tremie pipe through the hopper, so that when the concrete is forced down from the hopper to the pipe it will force the plug (and along with any water in the pipe) down the pipe and out of the bottom end, thus establishing a continuous stream of concrete. It will be necessary to raise slowly the tremie in order to allow a uniform flow of concrete, but it shall not be emptied so that water enters above the concrete in the pipe. At all times after the placing of concrete is started and until all the required quantity has been placed, the lower end of the tremie pipe shall be kept below the top surface of the plastic concrete. This will cause the concrete to build up from below instead of flowing out over the surface, and thus avoid formation of layers of laitance. If the charge in the tremie is lost while depositing, the tremie shall be raised above the concrete surface, and unless sealed by a check valve it shall be re-plugged at the top end, as at the beginning, before refilling for depositing further concrete.

b) Drop Bottom Bucket

The top of the bucket shall be closed. The bottom doors shall move freely downward and outward when tripped. The bucket shall be filled completely and lowered slowly to avoid backwash. It shall not be

dumped until it rests on the surface upon which the concrete is to be deposited and when discharged shall be withdrawn slowly until well above the concrete.

To minimize the formation of laitance, great care shall be exercised not to disturb the concrete as far as possible while it is being deposited.

9.0 CURING OF CONCRETE:

9.1 PROTECTION AND WATER CURING

Immediately after compaction, concrete shall be protected against harmful effects of weather, including rain, running water, shocks, vibration, traffic, rapid temperature changes and premature drying out. It shall be covered with wet sacking, hessian or other similar absorbent material approved by the Engineer-in charge soon after the initial set, and shall be kept continuously wet for a period of not less than 21 days from the date of placement. Masonry work over the foundation concrete may be started after 48 hours of its laying but the curing of concrete shall be continued for a minimum period of 21 days.

9.2 STEAM CURING

Where steam curing is adopted it shall be ensured that it is done in a suitable enclosure to contain the live steam in order to minimize moisture and heat losses. The initial application of the steam shall be from two to Three hours after the final placement of concrete to allow the initial set of the concrete to take place.

Where retarders are used, the waiting period before application of the steam shall be increased from Three to Three hours.

The steam shall be at 100% relative humidity to prevent loss of moisture and to provide excess moisture for proper hydration of the cement. The application of steam shall not be directly on the concrete, and the ambient air temperature shall increase at a rate not exceeding 5°C per hour until a maximum temperature of 60°C to 70°C is reached. The maximum temperature shall be maintained until the concrete has reached the desired strength.

When steam curing is discontinued the ambient air temperature shall not drop at a rate exceeding 5°C per hour until a temperature of about 10°C above the temperature of the air to which the concrete will be exposed, has been reached.

10.0 WORKING IN EXTREME WEATHER

When depositing concrete in very hot weather, precautions shall be taken

so that the temperature of wet concrete does not exceed 38°C while placing. This shall be achieved by stacking aggregate under sheds and keeping it moist using cold water or crushed or flaked ice if specified and permitted by the Engineer, reducing the time between mixing and placing to the minimum, cooling formwork by sprinkling water on the exterior, starting curing before the concrete dries out and restricting concreting, as far as possible, to mornings and evenings.

During hot weather and rains the concrete shall be covered with tarpaulin and transported and placed in the forms and consolidated to final state. Commencement of concrete pours shall be avoided during heavy rains, storms and high winds.

11.0 FINISHING

Immediately after the removal of forms, all exposed bars or bolts passing through the reinforced cement concrete member and used for shuttering or any other purpose shall be cut inside the reinforced cement concrete member to a depth of at least 25mm below the surface of the concrete and the resulting holes be closed by cement mortar.

All cavities produced by the removal of form ties, all holes and depressions, honey-comb spots, broken edges or corners and all other defects shall be thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar of cement and fine aggregate mixed in the proportions used in the grade of concrete that is being finished and of as dry a consistency as is possible to use. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surfaces which have been filled /pointed shall be kept moist for a period of twenty-Three hours. Any repair and rectification of defective work is to be undertaken and carried out as directed by the Engineer-in charge.

If soft pockets/honey-combs, in the opinion of the Engineer-in-charge, are of such an extent or character as to affect the strength of the structure materially or to endanger the life of the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the portions of the structure affected.

All construction and expansion joints in the completed work shall be left carefully tooled and free from any mortar and concrete. Expansion joint filler shall be left closed for its full length with clean and true edges.

Specification for form liners for aesthetic treatment to concrete elements:

Aesthetic treatment to the concrete elements shall be executed using polyurethane electrometric form liner system. The form liner adherence to the moulds, the flexibility, elasticity and other parameters shall be as per Reckli standards. The gluing shall be done using primers and adhesives as

per Reckli specifications.

12.0 CONSTRUCTION JOINTS

Concreting shall be carried out continuously up to the construction joints, the position and details of which shall be as shown on approved drawings or as directed by the Engineer-in-charge. Such joints shall, however, be kept to the minimum.

For a vertical construction joint, a stopping board shall be fixed previously at the pre-determined position and shall be properly stayed for sufficient lateral rigidity to prevent its displacement or bulging when concrete is compacted against it. Concreting shall be continued right up to the board. The board shall not be removed before the expiry of the specified period for removal of vertical forms.

Before resuming work at a construction joint where the concrete has not yet fully hardened, all laitance shall be removed thoroughly, care being taken to avoid dislodgement of coarse aggregates.

When work has to be resumed on a surface which has hardened, the surface shall be thoroughly hacked, swept clean, wetted and covered with a layer of neat cement grout. The neat cement grout shall be followed by a 13mm thick layer of mortar mixed in the same proportion as in the concrete and concreting resumed immediately thereafter. The first batch of concrete shall be rammed against the old work to avoid formation of any soft pockets, particular attention being paid to corners and close spots.

In all cases, the position and detailed arrangement of all construction joints shall be predetermined and got approved by the Engineer-in-charge.

13.0 TESTS AND STANDARDS OF ACCEPTANCE

13.1 PRELIMINARY TESTS FOR CONTROLLED CONCRETE

For controlled concrete preliminary tests referred to Para 2.1 & 3.0 shall consist of three sets of separate tests, and in each set, tests shall be conducted on Three specimens. Not less than one set of Three specimens shall be made on any particular day. Of the Three specimens in each set, three shall be tested at seven days and the remaining three at 28 days. The preliminary tests of 7 days are intended only to indicate the strength likely to be attained at 28 days.

13.2 WORK STRENGTH TESTS FOR CONTROLLED AND NORMAL CONCRETE

Samples from concrete shall be taken as per IS: 1199 and cubes shall be made, cured and tested in accordance with IS: 516. Each test shall be of Three specimens, three of which shall be tested at seven days and the remaining three at 28 days. The cubes shall be

made at the rate of one set for every 50 cubic meter of concrete or a part thereof for each grade. However, if in each grade concreting done in a day is less than 15 cubic meter, the number of cubes can be reduced to 6 with the specific permission of the Engineer-in-charge.

Similar works tests shall be carried out whenever the quality and grading of materials is changed irrespective of the quantity of concrete poured. The number of specimens may be suitably increased as deemed necessary by the Engineer-incharge, when procedure of tests given above reveals a poor quality of concrete and in other special cases.

All work shall be carried out under the supervision of a qualified and a competent Engineer who will supervise proportioning, placing and compacting of concrete at all stages.

All necessary labour, materials, equipment, etc. for sampling, preparing test cubes, curing, etc., shall be provided by the Contractor. Testing of the materials and concrete may be arranged by the Engineer-in-charge in an approved laboratory at the cost of the contractor.

13.3 STANDARD OF ACCEPTANCE

The average strength of the group of cubes cast for each day shall not be less than the specified works cube strength. 20 percent of the cubes cast for each day may have values less than the specified strength provided the lowest value is not less than 85 per cent of specified strength.

13.4 MANUFACTURER'S CERTIFICATION: TESTING RESULTS ETC.

For all materials required for concrete construction including cement, aggregate, water, reinforcing and prestressing steel the original copies of test certificates, test results etc. either carried out by the manufacturer or any other agency, the mix design recommendations etc. shall be submitted to the Engineer-in-charge for his approval and record. It shall remain the property of the Engineer-in-charge.

13.5 CHLORIDE / SULPHATE CONTENTS

Since the chloride contents of the constituent materials of the concrete would be additive, it is desirable to keep a check on the overall chloride / sulphate contents of the concrete to keep it minimal. Specially, for pre stressed concrete, the total chloride / sulphate contents of the concrete when manufactured according to the requirements of workability and strength shall be as given below. The cost of testing for the chloride / sulphate contents of the ingredients of concrete and of undertaking remedial measures if the

chloride / sulphate contents are more than the permissible limit shall be borne by the contractor.

- a) Total water soluble sulphate (SO₂) content of the concrete mix expressed as (SO₂) shall not exceed 4 per cent by mass of cement used in the mix.
- b) Total chloride content of concrete expressed as chloride-ion shall not exceed the following values by mass of content used:

Type	Percent
PSC	0.10
R.C.C. (in severe condition of closure)	0.20
R.C.C. (in moderate condition of exposure and PCC)	0.30

14.0 REPAIR WORK

Concrete with unsatisfactory test results or with any minor defects shall be considered unsatisfactory. It shall be allowed to be repaired by cutting out the unsatisfactory material and by replacing it with new concrete, if so allowed by the Engineer-in-charge. Voids to be so filled shall be provided with anchors, keys or dovetail slots wherever necessary to attach the new material securely in place. Surface of prepared voids shall be wetted for 24 hours before the patching material is placed. Repair of concrete shall be made by skilled workmen. Repairs shall be made as soon as practicable after removal of forms and in a manner to meet the requirements for the finish specified for the particular location.

For repair of the concrete works, the contractor may use epoxy as a bonding agent prior to placing fresh concrete. The use or otherwise of epoxy for the repair work will be at the discretion of the Engineer-in-charge. Epoxies shall be applied strictly in accordance with the instructions of the manufacturer.

Epoxy is a two packed or three packed system containing base and hardener/s. The shelf life of the unmixed cans is about one year or more when stored in a place where ambient temperature does not increase beyond 75°F. The base and hardener/s shall be mixed in the correct proportions recommended by the manufacturer. The blend, after mixing intimately, shall have a pot life of one hour and the material shall be applied over the old concrete to form a thin film. Fresh concrete shall be deposited immediately prior to the film drying up so as to ensure proper bonding between both concrete.

Where the dry pack method is used, holes shall be sharp and square at the surface edges, but corners within holes shall be rounded. The perimeter of the hole shall be under-cut in several places. Holes for dry pack shall have

a minimum depth of 25mm. The holes to be repaired shall be scrupulously clean and slightly wet with no free water on the surface. The surface shall then be dusted lightly with cement by means of dry brush. Under no conditions shall the holes be painted with neat cement grout.

The dry pack mix shall be proportioned by weight: 1 part cement to 2.5 parts of sand that will pass a No. 16 screen. Only enough water shall be used to produce a mortar which will stick together when moulded into a ball by a slight pressure of the hands and will not extrude water but will leave the hands just damp.

Dry pack material shall be placed and packed in layers having a compacted thickness of about 10mm. Each layer shall be solidly contacted over its entire surface by use of hardwood stick and hammer. The stick is normally about 300mm to 460mm long and not over 30mm in diameter. Most of the tamping should be directed at a slight angle and towards the side of the hole to assure maximum compaction and bond. Water shall not be used to facilitate finishing.

Filling material used in repair of surfaces which will be exposed after completion of the project shall be made with cement from the same sources as that used in concrete and blended with a sufficient amount of white Portland cement to produce the same color as in the adjoining concrete. Patched surfaced shall be given a final treatment as required to make the texture of the patch match that of the surrounding material.

Immediately after patching is completed, the patched area shall be covered with an approved non-staining, water-saturated material which shall be kept wet and protected against sun and wind for a period of 12 hours. Thereafter, the patched area shall be kept continuously wet by a fine spray or sprinkling of water for not less than 10 days as required. The layers of gunite may be reinforced with steel mesh if directed by the Engineer in charge.

All materials, procedures and operations used in the repair of concrete and also the finished work shall be subject to the approval of the Engineer-in-charge. All fillings shall be tightly bonded to the concrete and shall be sound, free from shrinkage cracks or dummy areas after the fillings have been cured and dried.

The extent of repair shall be decided upon by the Engineer-in-charge. The cost of repairs of defective areas shall be borne by the contractor. The Engineer-in-charge may adopt at his discretion any other method of repairing like grouting with cement grout, epoxy grouts or guniting etc., which will be carried out by the contractor at his cost as per the specifications supplied by the Engineer.

15.0 USE OF PLUMS IN ORDINARY CONCRETE

Use of plums in concrete shall not be permitted.

16.0 MEASUREMENT FOR PAYMENT

- i) The cement concrete shall be measured in cubic meters. In reinforced concrete the volume occupied by reinforcement shall not be deducted.
- ii) Any concrete used in excess of the theoretical dimensions as shown on the drawings will not be paid.
- iii) Unacceptable work:
All defective concreting work, including but not limited to defects arising out of honey-combing, under sizing, under strength, etc. will have to be demolished and rebuilt by the Contractor at his own cost as may be directed by the Engineer-in-charge. In the event of such works being accepted by carrying out repairs etc. as suggested by the contractor and accepted by the Engineer-in-charge he will be paid for the work actually carried out by him at the reduced rate as may be decided by the Engineer-in-charge for portion of the work that may be accepted with repairs done by the Contractor.

17.0 RATE

The unit rate for concrete shall include the cost of all materials, labour, tools and plant required for mixing, placing in position, vibrating and compacting, finishing as per directions of the Engineer-in-charge, curing and all other incidental expenses for producing concrete of specified strength to complete the structure or its components as shown on the drawings and according to these specifications. The rate shall also include the cost of making, fixing and removing of all centering and forms required for the work unless otherwise specified in the contract.

All expenses likely to be incurred by the contractor in transporting materials procured at the site of works, the expenses incurred in improving the quality of materials to acceptable levels (such as screening, washing, etc.) and expenses incurred in proper storage of materials as directed by the Engineer-in-Charge etc. are to be included in the unit rate.

18.0 STEEL REINFORCEMENT

18.1 BENDING OF REINFORCEMENT

Reinforcing steel shall conform accurately to the dimensions shown on relevant drawings and conforming to IS: 2502.

Bars shall be bent cold to the specified shape and dimensions or as directed by the Engineer-in-charge using a proper bar bender, operated by hand or power to attain proper radii of bends. Bars shall not be bent or straightened in a manner that will injure the material. Bars bent during transport or handling shall be straightened before being used on work; they shall not be heated to facilitate bending.

Unless otherwise specified, a U type hook at the end of each bar shall invariably be provided. The hook shall be of required as specified in IRC code of practices. In case of deformed or bars which are not round, the diameter shall be taken as the diameter of a circle having an equivalent effective area. The deformed bar shall have standard L hooks when under tension. The hook shall be suitably encased with adequate concrete cover to prevent any splitting of the concrete.

Before cutting and bending a full scale sketch shall be drawn on a leveled platform and lengths measured before cutting.

18.2 PLACING OF REINFORCEMENT

All reinforcing bars shall be accurately placed in the exact position shown on the drawings, and shall be securely held in position during placing of concrete by annealed binding wire not less than 1mm in size and conforming to IS: 280, and by using stays, concrete blocks of same strength of concrete or metal chairs, spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals. Bars will not be allowed to sag between supports nor displaced during concreting or any other operation over the work. All devices used for positioning shall be of non-corrodible material. Wooden and metal supports will not extend to the surface of concrete, except where shown on the drawings. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing will not be allowed. Pieces of broken stone, brick or wooden blocks shall not be used for cover blocks. Only especially cast concrete/mortar blocks or HDPE cover blocks shall be allowed. Layers of bars shall be separated by spacer bars, precast concrete blocks of same strength of concrete or other approved devices only.

Reinforcement after being placed in position shall be maintained in a clear condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed.

To protect reinforcement from corrosion, concrete cover shall be provided as indicated on the drawings. All bars protruding from concrete to which other bars are to be spliced and which are likely to be exposed for an indefinite period shall be protected by a thick coat of neat cement slurry.

In the case of columns and walls, vertical bars shall be kept in normal position with timber templates having slots accurately cut in for bar position. Such templates shall be removed after the concreting has progressed up to a level just below them.

Bars crossing each other, where required, shall be secured by annealed binding wire of size not less than 1mm and conforming to IS:280 in such a manner that they do not slip over each other at the time of fixing and concreting. As far as possible, bars of full length shall be used. In case this is not possible, overlapping of bars shall be done as directed by the Engineer-in-Charge. Overlapping bars shall be bound with annealed steel wire, not less than 1mm thickness twisted tight. The overlaps shall be staggered for different bars and located at points along the span where neither shear nor bending moment is maximum. However at any section not more than 50% of bar shall be spliced for FE-415 / 500 grade bar and not more than 25% for Fe-240 grade bars.

18.3 WELDING OF BARS

When permitted or specified on the drawings, joints of reinforcement bars shall be butt-welded so as to transmit their full strength. Welded joints shall preferably be located at points where the reinforcement steel will not be subject to more than 75 percent of the maximum permissible stresses and the welded joints should be staggered such that, at any one section, not more than 20 percent of the rods are welded. Only electric arc welding using a process which excludes air from the molten metal and conforms to any or all other special provisions for the work will be accepted. Suitable means shall be provided for holding the bars securely in position during welding. It must be ensured that no voids are left in welding and when welding is done in 2 or 3 stages, the previous surfaces shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust, grease, paint and other foreign matter before welding. Only competent welders shall be employed on the work.

The M.S electrodes used for welding shall conform to IS: 814.

Welding of Fe-240 bars conforming to IS-432 shall be permitted. Welding of other grades of bars including Fe 415/500 grade bars conforming to IS-1786 shall in general be prohibited.

Welded pieces of reinforcement shall be tested. Specimens shall be taken from the actual site and their number and the frequency of tests shall be as directed by the Engineer-in-charge.

18.4 MEASUREMENT FOR PAYMENT

Reinforcement shall be measured in length, separately for different diameters, as actually used in the work including overlaps. From the length so measured the weight of reinforcement shall be calculated in tones as per IS: 1732. Lengths shall also include hooks at ends. Wastage, avoidable overlaps, couplings, welded joints and annealed

steel wire for binding shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.

18.5 RATE

Rate for reinforcement shall include cost of all steel, its bending, placing, binding and fixing in position as shown on the drawings and as directed by the Engineer-in-charge. It shall also include cost of all devices for keeping reinforcement in approved position, cost of jointing as per approved method, and tests to be carried out.

19.0 FORMWORK, FALSEWORK AND SCAFFOLDING:

All centering, formwork and temporary works shall be constructed according to duly approved drawings and specification. The design criteria and loading for these works shall be as per American Concrete Institute relevant specifications.

As soon as practicable after the acceptance of his tender the contractor shall submit a scheme showing the order of the procedure and methods by which he proposes to carry out the work together with such details as are necessary to demonstrate the adequacy, stability and safety of the methods which the contractor propose to adopt.

The approval to the general scheme of centering as well as design criteria and loading shall be obtained in good time to facilitate all preparatory work. Any delay on this account shall be the responsibility of the contractor.

Notwithstanding the approval given to the design criteria and loading and the general scheme for the centering, the entire responsibility for the satisfactory execution of the centering and all temporary works shall rest with the contractor and he shall be liable to pay all claims and compensation arising from any loss or damage to life and property due to any deficiency, failure or malfunctioning of the centering or all the temporary works.

- 1. Reuse of Forms etc.:** Forms required to be used more than once shall be maintained in serviceable conditions and shall be thoroughly cleaned and repaired before reuse. Where metal sheets are used for lining forms the sheets shall be placed and maintained in the forms with minimum amount of wrinkles, lumps or other imperfections. All forms shall be checked for shape and strength before reuse.
- 2. Erection and removal of forms.:**
 - i) Before placing concrete, the surface of all forms shall be covered with suitable non staining form releasing agents such as raw linseed oil so as to prevent sticking of concrete and to facilitate removal of forms.
 - ii) The form releasing agent shall cover the forms fully and

evenly without excess over drain. Care shall be taken to ensure that the agent does not spread on the surface of the construction joints and on reinforcement bars. Special care shall be taken to cover thoroughly the form strips for narrow grooves, so as to prevent swelling of the forms and the consequent damage to concrete prior to or during removal of forms.

- iii) Immediately before concrete is placed care shall be taken to see that all forms are in proper alignment and the supports and fixtures are properly secured and tightened.
- iv) Where forms for continuous surfaces are placed in successive units, the forms shall lap and fit tightly over the completed surface so as to prevent leakage of cement slurry from the fresh concrete and to maintain accurate alignment of the surface.
- v) Forms shall be left in place until their removal is authorized and shall then be removed with care so as to avoid injury to concrete.
- vi) Removal of forms shall never be started until the concrete is thoroughly set and hardened adequately to carry its own weight, besides the live load which is likely to come on the work during construction. The length of time for which the forms shall remain in place shall be decided by the engineer-in-charge, with reference to weather conditions, shape and position of the structure of structural member and nature and amount of dead and live loads. In normal circumstances and where ordinary Portland cement is used forms can be allowed to be struck as under:

A	Beam sides, walls, unloaded columns	after	24 hours
B	Slabs and arches (props left under)	after	4 days
C	Props to slabs and arches	after	10 days
D	Beam soffit (props left under)	after	8 days
E	Props to beams	after	21 days

Note: Time shall be measured from last batch concrete in respect to the structural member under consideration. In no case shall forms be removed until there is an assurance that removal can be accomplished without damaging the concrete surface. Heavy loads shall not be permitted until after the concrete has reached its design strength. The forms shall be removed with great caution and without jerking the structure.

3. Settlement of Formwork and Camber:

Due to various reasons such as closure of form joints, shrinkage of timber, dead load deflection, elastic shortening of form members formwork deflection or settlement may occur. The members of the formwork must be rigid enough to prevent excessive deflections the usual acceptable limit being $1/500$ of the spans of the formwork. In the absence of any specified camber on the drawings, soffit of all beams more than 5m in span and other than pre-stressed concrete beams shall be laid to a camber the amount of which mid span shall not be less than $1/500$ of the span of the structure. The profile of soffit shall be parabolic.

4. Mock-Ups:

The method for pouring difficult zones of concrete will be pre-studied on mock-ups. Mock-ups will be particularly necessary for the following:

- i) Zones around penetrations and openings.
- ii) Behind anchorages of pre-stressed members.
- iii) Dome and shell in general requiring single and double forms.
- iv) Various zones of large thickness for studying placement temperatures in relation to internal temperature build ups.

Work involved in mock-up pours will be paid for at the rates entered under relevant items of work. Materials which are of free supply as mentioned in this document, such as steel, embedment, etc. will also be supplied free for mock-up pours. Sampling and testing of all samples will be done by the contractor. Unsuccessful mock-ups may have to be repeated in full or in part as required by the engineer. No payment shall be made for work involved in unsuccessful mock up attributed to elements designed by the Contractor. The mock up unit shall be dismantled and cleared from site without any extra cost, as directed by Engineer-in-charge.

20.0 Tolerance :

All works shall be carried out true to the lines, levels, and grades shown on the drawings and within the tolerances specified below. The contractor shall establish, erect and maintain project control points and bench marks necessary and adequate to establish these tolerances in an undisturbed condition until final completion and acceptance of the work.

Dimensional Tolerances

Departure from established alignment of all elements: 30mm

Departure from established grades: 10mm

Variation from plumb or specified: 12mm in 3m. (if exposed)

Batter in lines and surface of:	(25mm in 3m. if Back filled columns, piers, walls and in arises)
Variation from level or indicated:	12mm in 3m
in slabs, beams, horizontal and railing offsets:	(if exposed) Grade 25mm in 3m. (if backfilled)
Variation in cross sectional dimensions of columns, Piers, slabs, walls, beams and similar parts:	6mm plus 12mm
Variation in slab thickness:	-3mm plus 6mm
Footings / Plan dimensions:	-15mm plus 30mm
Misplacement of eccentricity:	-2% of footing dimension in the direction of misplacement and not exceeding 30mm.
Reduction in thickness:	-5% of specified
Thickness	
Variation in size and locations of slabs, well:	-12mm.
Openings	
Pre stressed concrete cables will be laid such that their profile is a smooth curve unless otherwise specified.	
The alignment tolerances shall be as under.	
Member with a depth of up to 200 mm:	+/-d/40
200 – 1000 mm:	+/-5mm
more than 1000 mm:	+/-10mm
Tolerance in direction of width of member at the level of tendon	
Up to 200mm wide:	+/-5mm
200 – 1000mm wide:	+/-10mm
Slabs and beams of more than 1000: mm width.	+/-20mm
Tendon extensions will be measured up to 1mm accuracy. The total pre stressing force applied to a beam shall not vary more than $\pm 3\%$ from the design force specified and measured in terms of the total elongations of all the tendons in that member. In case of slabs, these variations shall be measured and restricted over a range of 5 consecutive tendons.	

ITEM SPECIFICATION

1.0. Materials:

1.1. Water shall conform to M-1. Sand shall conform M-6. Cement shall conform to M-3. Stone aggregate 40 mm. nominal size shall conform to M-12.

2.0. Workmanship:

2.1. General:

2.1.1. Before starting concrete bed of foundation teaches shall be cleared of all loose materials, leveled, watered, and rammed as directed.

2.2. Proportion of Mix:

2.2.1. The proportion of cement, sand and coarse aggregate shall be one part of cement, 4 parts of sand, 8 parts of stone aggregates and shall so measured by volume.

2.3. Mixing:

2.3.1. The concrete shall be mixed in a mechanical mixer at the site of work. Hand mixing may however be allowed for smaller quantity of work if approved by the Engineer-in-charge. When hand mixing is permitted by the Engineer-in-charge in case of break-down of machinery's and in the interest of the work. It shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. However in such cases 10% more cement than otherwise required shall have to be used without any extra cost. The mixing in mechanical mixer shall be done for a period 1 to 2 minutes. The quantity of water shall be sufficient to produce a dense concrete of required workability for the purpose.

2.4. Transporting & placing the concrete:

2.4.1. The concrete shall be handled from the place of mixing to the final position in not more than 15 minutes by the method as directed and shall be placed into its final position, compacted and finished within 30 minutes of mixing with water i.e. before the setting commences.

2.4.2. The concrete shall be laid in layers of 15 cms. to 20 cms.

2.5. Compacting:

2.5.1. The concrete shall be rammed with heavy iron rammers and rapidly to get the required compaction and to allow all the interstices to be filled with mortar.

2.6. Curing:

2.6.1. After the final set, the concrete shall be kept continuously wet, if required by pounding for a period of not less than 7 days from the date of placement.

ITEM NO. 18: PROVIDING AND FIXING PRE-CAST RUBBER DYE /

STEEL DYE INTER LOCKING CONCRETE BLOCK 60MM THICK WITH GRADE OF CONCRETE M300 PNUMATIC COMPRESSED / VIBRATED MECHANICALLY AND AS PER APPROVED DESIGN CONFIRMING TO IS 15658: 2006 INCLUDING 35 MM SAND LAYER FOR LEVELLING AND FILLING THE JOINT WITH SAND IN PROPER LINE AND LEVEL AS PER GUIDELINES OF IRC: SP 63-2018 ETC. COMPLETE.

ITEM NO. 19: PROVIDING AND FIXING PRE-CAST RUBBER DYE INTER LOCKING CONCRETE BLOCK 80MM THICK WITH GRADE OF CONCRETE M300 PNUMATIC COMPRESSED BY MECHANICALLY PRESSED AND AS PER APPROVED DESIGN INCLUDING 75MM SAND LAYER FOR LEVELLING AND FILLING THE JOINT WITH SAND IN PROPER LINE AND LEVEL ETC COMPLETE.

ITEM NO. 20: REFITTING OF PRE-CAST RUBBER DYE INTER LOCKING CONCRETE (PAVER BLOCK) INCLUDING 75MM THICK SAND LAYER FOR LEVELLING AND FILLING THE JOINT WITH SAND IN PROPER LINE AND LEVEL ETC. COMPLETE

Paver Block manufacturing facilities

1.1. Design Mix Concrete:

- 1.1.1. All pavers designated by strength shall be treated as design mix concrete. The aggregate and cement shall be measured by weight in an approved weigh batching equipment. Mixing water shall be measured in graduated litre cans. One or more complete bags of cement shall be used for each batch of concrete.
- 1.1.2. The contractor shall be responsible for designing mixes of the specified performance to suit the degree of workability and characteristic strength. The mix design shall be finalized before manufacturing of the paver considering a set of suppliers for cement, sand and aggregates. In case of any change of suppliers of cement, sand or aggregates, party should have design mix ready for alternate suppliers.
- 1.1.3. The minimum cement content for compacted concrete of pavers shall not be less than 380 Kg / cum.
- 1.1.4. The maximum water cement ratio for pavers concrete shall not be more than 0.40

- 1.1.5. The design mix proportions for each set of raw material suppliers shall be finalized and approved by the authorized lab for the required compressive strength and the lab report with proportions should be available with the vendor at all times for scrutiny and verification purpose.

1.2. Paver Block Making Machine:

The machine should be capable of producing high quality Paver Blocks by obtaining high level of compaction by application of hydraulic compaction and also by high intensity vibration to the moulds. The machine should have automatic control panel and shall apply a minimum pressure of 3000 psi and then there shall be automatic cut off of hydraulic circuit without any manual interference. In no case, pavers mold by manual force or by machine without auto cut off shall be accepted. All pavers shall have uniformity in strength.

1.3. Weigh Batching & Mixing Equipment:

- 1.3.1. The proportioning of ingredients of concrete per batch of concrete shall be performed by an approved weigh batching machine. Water shall be fed into the mixer from a tank provided with means for adjusting the flow of water so as to supply the quantity determined for concrete as per mix design. Due allowance shall be made for the weight of water carried by aggregates so that actual amount added at the mixer can be reduced as necessary. For this purpose, the moisture content of coarse and fine aggregates shall be ascertained as and when required and at other times when alteration of the moisture content may be expected due to new deliverance of aggregates, inclement weather or other reasons.
- 1.3.2. Volumetric batching of concrete may be allowed after the design mix is approved by lab after testing, by converting the proportion of concrete from weight to volumetric measurement subject to facilities being made available by the contractor for verifying and monitoring this.
- 1.3.3. All necessary equipment such as measuring boxes, devices for determination of moisture and bulking in sand, slump cone, etc. shall be provided by the contractor. Concrete shall be machine mixed until there is a uniform distribution of materials and uniform colour and consistency is achieved and under no circumstances for less than two minutes.

The concrete Mix Design should be followed for each batch of materials.

1.4. Curing:

The factory should have well designed curing area to ensure adequate (minimum 14 days) curing of paver blocks.

1.5. Laboratory:

The factory should have the following:

- (i) Compression testing machine of capacity minimum 200 MT
- (ii) Other tools and equipment for testing raw materials and paver blocks.
- (iii) (1) Systematic record of test results of various paver blocks manufactured in the factory.
(2) Concrete Mix Design for desired grade of concrete used for making of paver blocks.

2. Raw Materials.

2.1. CEMENT

The cement used in the manufacture of high quality precast concrete paving blocks shall be conforming to IS 12269 (53 grade ordinary Portland cement) or IS 8112 (43 grade ordinary Portland cement) or IS 1489 (Part 1) (Portland-pozzolana cement – fly ash based). The minimum cement content in concrete used for making paver blocks should be 380 kg/Cum.

2.2. AGGREGATES

The fine and coarse aggregates shall consist of naturally occurring crushed or uncrushed materials, which apart from the grading requirements comply with IS 383-1970. The fine aggregates used shall contain a minimum of 25% natural silicon sand. Lime stone aggregates shall not be used. Aggregates shall contain no more than 3% by weight of clay & shall be free from deleterious salts and contaminants. Zone iv sand shall not be acceptable. Coarse aggregate shall be 10 mm and below.

2.3. WATER

The water shall be clean and free from any deleterious matter. It shall meet the requirements stipulated in IS: 456-2000.

2.4. OTHER MATERIALS

Any other materials / ingredients used in the concrete shall conform to I.S. Specifications.

PIGMENT: The pigment shall be used only on wearing and top surface and throughout the paver block. The pigment used shall not be more than 10% of weight of cement used in the wearing course layer. However, use of pigment shall in no way alter the required strength of

the paver block. Pigment used for coloring paver blocks shall have durable color. It shall not contain matters detrimental to concrete. The pigment shall not contain Zinc compound. Lead pigment shall not be used.

3. Pavers Block Characteristics

The inter locking concrete paver tiles should conform to IS-15658: 2006. They shall be tested as per the code and have to qualify limits specified by us down below.

- 3.1.** The paver tiles should be made of M-40 design mix concrete in approved size and shape. For acceptance the average of compressive strengths of 8 pavers shall be minimum 47.2 N/mm² (MPa). Any paver in the tested lot shall not have compressive strength less than 40.1 MPa. If needed, pavers shall be designed and manufactured on higher side to concrete grade M-40 to meet this requirement without extra cost to HPCL. Testing shall be done as per relevant clauses of IS-15658:2006.
- 3.2.** The concrete pavers should have perpendicularities after release from the mold and the same should be retained until the laying.
- 3.3.** The surface should be of anti-skid and anti-glare type.
- 3.4.** The paver should have uniform chamfers to facilitate easy drainage of surface run off.
- 3.5.** The concrete mix design should be followed of each batch of materials separately and weigh batching plant is to be used to achieve uniformity in strength and quality.
- 3.6.** The pavers shall be manufactured in single layer or more to ensure smooth surface on top and to remove all voids.
- 3.7.** The pavers shall be of cement Grey colour without any pigment or colored with pigment or with chemically treated top surface as specified.
- 3.8.** The pavers are to be skirted all round with kerbing or otherwise as per direction of EIC, using solid concrete blocks made of grade 1:1.5:3 concrete, of size 100mm X 200mm X 400mm. The kerbing should be embedded for 100mm depth. The concrete used for kerbing shall be cured properly for 7 days minimum. The payment for laying kerb blocks will be made separately on running meter basis. HPCL may decide for alternate skirting system to suite site requirements.
- 3.9.** All paver blocks shall be sound and free of cracks or other visual defects, which will interfere with the proper paving of the unit or impair the strength or performance of the pavement constructed with the paver blocks.

3.10. The compressive strength requirement of concrete paver block shall be minimum 47.2 MPa (N/sqmm) for 28 days (Testing as per IS-15658) after applying the correction factor as per IS-15658:2006. (Please refer clause 3.1 also).

4. Paver Block Dimensions

Thickness	80mm/60mm
Shape	Regular (Uniform shape with no Hollow or Cracks)
Chamfer	5 mm to 7 mm along top edges
Thickness of Wearing Layer	Minimum 6 mm (The thickness of the wearing surface shall be measured at several points along the periphery of paver blocks. The arithmetic mean of the lowest two values shall be the minimum thickness of the wearing layer)
Plan Area Asp (IS-15658:2006)	Maximum 0.03 m ²
Colour	Natural cement Grey colour without use of any pigment OR colour as specified
Dimensional Tolerance	Tolerances as per IS-15658:2006

Note: All other visual/physical & dimensional acceptance on parameters like aspect ratio, squareness etc. to be as per IS-15658:2006

5. Testing of Paver Blocks

FOR 80MM PAVER

SR. NO.	TEST	SPECIFICATION (Average Values)
1.	28-day Compressive Strength	Minimum 47.2 MPa (N/Sq mm) (for 80mm)
2.	Abrasion Resistance	Maximum 2 mm [i.e. 10 units of 1000 mm ³ per 5000 mm ² reported as per IS-15658:2000]
3.	Water Absorption	Avg. of 3 units - Maximum 6% by mass (restricted to 7% in individual test units)

FOR 60MM PAVER

SR. NO.	TEST	SPECIFICATION (Average Values)
1.	28-day Compressive Strength	Minimum 37.1 MPa (N/Sq mm) (restricted to 31.5 MPa in individual test units)

2.	Abrasion Resistance	Maximum 3 mm [i.e., 15 units of 1000 mm ³ per 5000 mm ² reported as per IS-15658:2000]
3.	Water Absorption	Avg. of 3 units - Maximum 6% by mass (restricted to 7% in individual test units)

- Sampling and Testing Procedure strictly As Per IS – 15658; 2006.

6. Laying of Paver Blocks

6.1. PRIMING

The contractor is required to verify the existing WBM driveway surface and ascertain the CBR value. Accordingly, the total subgrade thickness required for achieving the desired CBR value shall be advised to HPCL within seven days of receipt of call-up. HPCL shall, through regular vendors arrange to carry out such WBM, wherever required. Before taking over the site, the Paver block laying party is required to verify the stabilization of the surface with CBR values. In case, contractor does not advise the CBR value within seven days, HPCL shall carry out WBM as per own design, and contractor shall have no claim later particularly to the quality of WBM or sub-grade.

It will be the responsibility of the Paver block party to ensure that the Manholes / Pipeline / Cable trenches / circular drainage system etc. is raised to driveway level using the requisite materials as per instruction of EIC. The areas of potholes / deep depressions at the isolated locations shall be filled up and properly compacted before laying the paver blocks. No extra payment will be made for this purpose. The area of raised manholes shall be included in the measurement of overall area of paver blocks for the purpose of payment.

6.2. BEDDING SAND COURSE

The bedding sand shall consist of naturally occurring, clean, well graded sand passing through 4.75mm sieve and suitable to concrete manufacture.

The bedding should be from either a single source or blended to achieve the following grading.

IS SIEVE SIZE	% PASSING
9.52mm	100
4.75mm	95-100
2.36mm	80-100
1.18mm	50-100
600 microns	25-60
300 microns	10-60
150 microns	5-15

75 microns	0-10
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Contractor shall be responsible to ensure that single-sized, gap-graded sands or sands containing an excessive amount of fines or plastic fines are not used. The sand particles should preferably be sharp, not rounded. The sand used for bedding shall be free of any deleterious soluble salts or other contaminants likely to cause efflorescence.

The sand shall be of uniform moisture content, which shall be within 4% - 8%, at the time of spreading and shall be protected against rain when stockpiled prior to spreading. Saturated sand shall not be used.

The bedding sand shall be spread loose in a uniform layer as per drawing. The compacted uniform thickness shall be 50mm and within ± 5 mm. Thickness variation shall not be used to correct irregularities in the base course surface.

The spread sand shall be carefully maintained in a loose dry condition and protected against pre-compaction both prior to and following spreading. Any pre-compacted sand left overnight shall be loosened before further laying of paver blocks takes place.

Sand shall be slightly spread in a loose condition to the predetermined depth only slightly ahead of the laying of the paver block.

Any depressions in the spread sand exceeding 5mm shall be loosened, raked and re spread before laying of paver block.

6.3. LAYING OF INTERLOCKING PAVER BLOCK:

Paver block shall be laid in pattern as specified under cl. 7 throughout the pavement. Once the laying pattern has been established, it shall continue without interruption over the entire pavement surface. Cutting of blocks, the use of infill concrete or discontinuities in laying pattern is not to be permitted in other than approved locations.

Paving units shall be placed on the uncompacted sand bed to the nominated laying pattern; care shall be taken to maintain the specified bond throughout the job. The first row shall be located next to an edge restraint. Specially manufactured edge paving units are permitted or edge units may be cut using a power saw, a mechanical or hydraulic guillotine, bolster or other approved cutting machine. No haphazardly broken pavers shall be used.

Paver block shall be placed with the help of spacers to achieve gaps nominally 2 to 3mm wide between adjacent paving joints. No joint shall be less than 2mm nor more than 4mm. However it is mandatory to use 3.0mm wide spacer while laying paver tiles so as to ensure uniform 3.0mm gap between adjacent pavers. Frequent use of string lines shall be used to check alignment. In this regard, the "laying face" shall be checked at least every two meter as the face proceeds. Should the face

become out of alignment, it must be corrected prior to initial compaction and before further laying job is proceeded with.

In each row, all full units shall be laid first. Closure units shall be cut and fitted subsequently. Such closure units shall consist of not less than 25% of a full unit.

To fill spaces between 25mm and 50mm wide, concrete having minimum 1:1:2 cement: sand: coarse aggregate mix and a strength of 40 N/Sq mm shall be used. Within such mix the nominal aggregate size shall not exceed one third the smallest dimension of the infill space. For smaller spaces dry packed mortar shall be used.

Except where it is necessary to correct any minor variation occurring in the laying bond, the paver block shall not be hammered into position. Where adjustment of position is necessary care shall be taken to avoid premature compaction of the sand bedding.

6.4. INITIAL COMPACTION

After laying the paver block, they shall be compacted to achieve consolidation of the sand bedding and brought to design levels and profiles by not less than two (2) passes of a suitable plate compactor.

The compactor shall be a high-frequency, low amplitude mechanical flat plate vibrator having plate area sufficient to cover a minimum of twelve paving units.

Prior to compaction all debris shall be removed from the surface.

Compaction shall proceed as closely as possible following laying and prior to any traffic. Compaction shall not, however, be attempted within one meter of the lying face. Compaction shall continue until lipping has been eliminated between adjoining units. Joints shall then be filled and recompactd as described in Clause 6.5

All work further than one meter from the lying face shall be left fully compacted at the completion of each day's laying.

Any blocks that are structurally damaged prior to or during compaction shall be immediately removed and replaced.

Sufficient plate compactors shall be available at the paving site for both bedding compaction and joint filling.

6.5. JOINT FILLING AND FINAL COMPACTION

As soon as practical after compaction and in any case prior to the termination of work on that day and prior to the acceptance of any traffic, sand for joint filling shall be spread over the pavement.

Joint sand shall pass a 2.36mm (No. 8) sieve and shall be free of soluble salts or contaminants likely to cause efflorescence. The same shall comply with the following grading limits:

IS SIEVE SIZE	% PASSING
2.36mm	100
1.8mm	90-100
600 mm	60-90
300 microns	30-60
150 microns	15-30
75 microns	10-20

The Contractor shall supply a sample of the jointing sand to be used in the contract prior to delivering any such material to site for incorporation into the works. Certificates of test results issued by a recognized testing laboratory confirming that the sand sample conforms to the requirements of this specification shall be submitted prior to supply of total volume required.

The jointing sand shall be broomed to fill the joints. Excess sand shall then be removed from the pavement surface and the jointing sand shall be compacted with not less than one (1) pass of the plate vibrator and joints refilled with sand to full depth. This procedure shall be repeated until all joints are completely filled with sand. No traffic shall be permitted to use the pavement until all joints have been completely filled with sand and compacted.

Both the sand and paver block shall be dry when sand is spread and broomed into the joints to prevent premature setting of the sand.

The difference in level (lipping) between adjacent units shall not exceed 3mm with not more than 1% in any 3m X 3m area exceeding 2mm. Pavement portions which are deformed beyond above limits after final compaction, shall be taken out and re-laid to the satisfaction of the Engineer in charge.

6.6. EDGE RESTRAINT USING KERB BLOCK

Edge restraints shall be done using the kerb blocks as specified in 3.9. They should be fixed properly to withstand overriding by the anticipated traffic, thermal expansion and to prevent loss of the laying course material from beneath the surface course. The edge restraint should present a vertical face down to the level of the underside of the laying course.

The surface course should not be vibrated until the edge restraint, together with any bedding or concrete haunching, has gained sufficient strength. It is essential that edge restraints are adequately secured.

6.7. UNIFORM INTERLOCKING SPACES

The pavers should have uniform interlocking space of 2mm to 3mm to ensure compacted sand filling after vibration on the paver surface.

6.8. SKILLED LABOUR

Skilled labour should be employed for laying blocks to ensure line and level of pavers, desired shape of the surface and adequate compaction of the sand in the joints.

7. Laying Pattern:

Red and Grey Pavers in Combination of 1 red line and 2 grey lines to be laid at 45 degrees to road from the ingress side.

Contractor's Signature with address

Place:

Date:

**CHIEF OFFICER
UNA NAGARPALIKA
UNA
Dist.: Gir-Somnath**