BORDER ROADS ORGANISATION
Ministry of Defence

CHIEF ENGINEER PROJECT DANTAK

NAME OF WORK: **CONSTRUCTION OF 20 NOS OF 2 MTR SPAN RCC CULVERTS IN CONVENTIONAL METHOD AND PROVIDING AND LAYING OF WMM 100 MM AND 75 MM COMPACTED THICKNESS, DBM 60 MM COMPACTED THICKNESS AND BC 40 MM COMPACTED THICKNESS INCLUDING APPLICATION OF PRIME COAT, TACK COAT, ROLLING AND COMPACTION AS PER MORT&H SPECIFICATIONS AND ROAD MARKING WITH THERMOPLASTIC PAINT 2.50 MM THICK CONFORMING TO MOST 803.4 INCLUDING PREPARATION OF SURFACE FOR CARRYING OUT SURFACING WORKS BETWEEN KM 48.000 TO KM 53.000 ON CONFLUENCE - HAA ROAD UNDER 19 BRTF OF PROJECT DANTAK INSIDE BHUTAN.**

Name of Contractor: _____

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SW
For Accepting Officer

(Signature of the Contractor)

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Headquarters
Chief Engineer
Project Dantak
PIN : 931708
C/O 99 APO

80553/ /E8 Mar 2021

M/s _____

_____

NAME OF WORK : CONSTRUCTION OF 20 NOS OF 2 MTR SPAN RCC CULVERTS IN CONVENTIONAL METHOD AND PROVIDING AND LAYING OF WMM 100 MM AND 75 MM COMPACTED THICKNESS, DBM 60 MM COMPACTED THICKNESS AND BC 40 MM COMPACTED THICKNESS INCLUDING APPLICATION OF PRIME COAT, TACK COAT, ROLLING AND COMPACTION AS PER MORT&H SPECIFICATIONS AND ROAD MARKING WITH THERMOPLASTIC PAINT 2.50 MM THICK CONFORMING TO MOST 803.4 INCLUDING PREPARATION OF SURFACE FOR CARRYING OUT SURFACING WORKS BETWEEN KM 48.000 TO KM 53.000 ON CONFLUENCE - HAA ROAD UNDER 19 BRTF OF PROJECT DANTAK INSIDE BHUTAN.

Dear Sir (s),

1. A set of tender documents for the above work is forwarded herewith. Please note that tender will be received by the Accepting Officer at the office of the Chief Engineer (P) Dantak C/O 99 APO or at OIC liaison cell located at HQ 19 BRTF, Jaigaon, Pin-930019, Ph 8145087696 up to **1100 hrs (BST) on 30 Mar 2021 and Part-I of the tender documents will be opened on 01 Apr 2021 at 1130 hrs (BST)** . Tender received after the due date and time will not be considered.

2. Tenderers or their duly authorized representative who have submitted their tenders and who wish to be present at the time of opening of tenders may attend the office of Accepting officer **Chief Engineer (P) Dantak C/O 99 APO** at the above mentioned time.

3. Tender documents may also be downloaded from CPP Portal **www.epublish.gov.in** and CAB website www.cab.org.bt and printout is to be taken on A4 size paper. It is advisable that downloaded tender document preferably to be printed through laser printer only.

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4. Tendering procedure shall be single stage-two bid System and tender documents shall be prepared in two parts as under :-

Part-I ('Technical Bid' – 'T' Bid)
Part-II ('Price/commercial' – 'Q' Bid)

5. **Part-I ('Technical Bid' – 'T' Bid)**

5.1 Part-I ('Technical Bid' – 'T' Bid) shall comprise of the following :-

(i) Eligibility/qualification documents.
(ii) Tender forwarding letter including eligibility criteria, list of qualification documents and instructions to tenderers.
(iii) Notice Inviting Tender
(iv) Undertaking for General conditions of contacts (IAFW 2249) forming part of contract agreement.
(v) Special Conditions of Contract.
(vi) Particular Specifications.
(vii) Any other tender documents except Price Bid.
(viii) Cost of tender documents if not already submitted.
(ix) Earnest money by "unenlisted contractors" and "enlisted contractors" who have not submitted standing security deposit.

5.2 **Technical evaluation criteria**

5.2.1 Bidder should have submitted cost of tender documents.

5.2.2 If contractor is not enlisted with BRO or enlisted with BRO but has not submitted standing security deposit, he should have submitted Earnest money.

5.2.3 All the pages of T-bid should have been duly signed by the bidder/authorized representative.

5.2.4 **Eligibility Criteria**:- (A) Tenderers shall meet the following eligibility criterias:-

A.1 Capabilities(this criteria is exempted for tenderers enlisted with BRO in eligible class* & above for works with estimated cost upto Rs. 25 crores as given in NIT).

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(a)	**Working Capital**: The tenderer should have working capital and/or credit facilities of at least 10% of the estimated cost of work as given in NIT i.e **Rs 59.82 Lacs**	Copy of latest balance sheet/income tax return for working capital and/or Banker's certificate for credit facilities. If necessary deptt will make inquiries with the tenderer's Banker.
(b)	**The Tenderer should have immovable property** of residual market value (i.e. free from loan / mortgage) of at least 10% of estimated cost of work given in NIT i.e **Rs 59.82 Lacs** Note:- Immovable property shall be exclusively in the name of contractor/company and not in the name of family members/relative/others. In case of limited companies, these should also be reflected in Balance Sheet.	Tenderer shall submit affidavit for immovable property incorporating following certificates in affidavit along-with valuation report from Registered (with any Govt body) valuer and registration certificate with any Govt body of registered valuer:- (a) That the immovable property is free from mortgages, hypothecation or any other disputes and encumbrances and clearly belongs to the contractor. OR That the immovable is free from any disputes and encumbrance and clearly belongs to the contractor. The immovable property has been mortgaged/hypothecated for Rs……..market value of immovable property as per valuation report given by Registered valuer is Rs ……therefore Residual market value of property i.e Rs……..(market value minus mortgaged value) is free from any mortgage/hypothecation. (b) That the said immovable property has not been shown for seeking enlistment of a sister concern in BRO. (c) That the said immovable property will not be sold, transferred, gifted or otherwise disposed off till satisfactory completion of the work.

(c) **Engineering establishment**: Firm should have employed following Engineers on regular establishment:-

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Estimated cost of work	Nos of Engineers
Up to Rs. 1.00 Crore	One Engineer (Graduate or Diploma)
Between Rs. 1.00 Crores to 3 Crores	Two Engineers (Graduate with minimum 2 years experience and/or Diploma with 4 years experience)
Between Rs. 3.00 Crs to 6.00 Crores	**Three Engineers (Graduate with minimum 2 years experience and/or Diploma with 4 years experience)**
Between Rs. 6.00 Crs to 12.00 Crores	Four Engineers (Graduate with minimum 2 years experience and/or Diploma with 4 years experience)
Between Rs. 12.00 Crs to 18 Crores	Five Engineers (Graduate with minimum 3 years experience and/or Diploma with 6 years experience)
Between Rs. 18.00 Crs to 25.00 Crores	Six Engineers (Graduate with minimum 3 years experience and/or Diploma with 6 years experience)
Between Rs. 25 .00Crs to 50.00 Crores	Seven Engineers (Graduate with minimum 3 years experience and/or Diploma with 6 years experience)
Between Rs. 50 .00Crs to 100.00 Crores	Eight Engineers (Graduate with minimum 3 years experience and/or Diploma with 6 years experience)

A.2 Experience

S/No	Experience Criteria	Documents to be submitted by the tenderers to prove eligibility
(a)	Tenderer should have successfully completed or substantially completed three similar works costing not less than the amount equal to **40%** of estimated cost of work i.e **Rs 239.29 Lacs** Or Two similar works costing not less than the amount equal to **50%** of estimated cost of work i.e **Rs 299.12 Lacs** Or One similar work costing not less than the amount equal to **80%** of estimated cost of work i.e **Rs 478.58 Lacs** in ""last seven & current" financial years. These similar works should have been successfully completed or substantially completed.	List of works completed/substantially completed in last seven and current financial years and ongoing works in the following format:- a) Name of work & CA No b) Brief scope of work c) Name and address of employer/clients d) Accepted contract amount e) Date of commencement of work f) Original date of completion. g) Extended date of completion h) Actual date of completion/Present progress j) Cost of completed work k) Remarks explaining reasons of delay if any Note:- Works providing eligibility criteria of experience shall be highlighted and performance certificate from client in respect of this work shall be submitted.

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A.3 **Available Bid Capacity (ABC)** as per formula given here-in-after should be more than the estimated cost of work given in NIT. (**Rs 598.23 Lacs**)

A.4 **Vehicles, Equipments and Plants (VEP)** :
Tenderer should own or have assured access (through hire/lease/purchase agreement/other commercial means) to the requisite Equipments, Plants and vehicles in good working condition as given hereunder:

S/No	Particulars of Veh/Eqpt/Plant	Nos Reqd
(a)	JCB	02
(b)	Tipper/Dumpers	05
(c)	Front end Loader	01
(d)	Static Road Roller (8-10 Ton)	01
(e)	Vibratory Tandem Road Roller (7 Ton)	01
(f)	Pneumatic Tandem Road Roller	01
(g)	Motor Grader	01
(h)	Hot Mix Plant (Fully Automated) 20/30 or 40/60 TPH or equivalent	01
(j)	WMM Plant	01
(k)	Paver Finisher Hydro-Static Sensor Type.	01
(l)	Self propelled Bitumen Emulsion Pressure Distributor	01
(m)	Air Compressor 171-190 Cfm or equivalent	01
(n)	Mechanical Broomer	01
(o)	Concrete Mixer	01
(p)	Water Truck	02
(q)	Total Station/Auto Level	01

A.5 **Performance and other requirements:**

(a) There should not be poor/slow progress in running works due to defaults of the tenderer.

(b) There should not be serious defects observed in works which stand unrectified by the tenderer.

(c) There should not be any Cancelled/abandoned contracts in which Govt. unrealized recoveries exist

(d) Tenderer should have not been blacklisted by any Govt. Deptt.

(e) These should not be any Govt. dues, outstanding against the tenderer.

(f) Tenderer should not be habitual litigant i.e. having more than 3 unsuccessful arbitration/court cases during the last 5 years in which his views/claims substantially rejected.

(g) Proprietor/partners/directors of firm should not be involved in anti national/social activities and should have neither been convicted nor any proceedings should be pending in court for such activities.

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Note for (A):-

(i) ***Eligible class** shall be class E for works with estimated cost up to Rs.0.15 crore (as per NIT), class D for works with estimated cost between Rs.0.15 crore to Rs.0.30 crore (as per NIT), class C for works with estimated cost between Rs.0.30 crore to Rs.0.60 crore (as per NIT), class B for works with estimated cost between Rs.0.60 crore to Rs.1.50 crore (as per NIT), class A for works with estimated cost between Rs.1.50 crore to Rs.3.00 crore (as per NIT), class S for works with estimated cost between Rs.3.00 crore to Rs.12.00 crore (as per NIT) and class SS for works with estimated cost between Rs.12.00 crore to Rs.25.00 crore (as per NIT).

(ii) For hiring of Vehicle/equipment/plant and supply of materials, execution of main works for which hiring/supply is required, shall also be treated as similar works. If contact is to be accepted in parts, tenderer shall meet the eligibility criteria as per estimated cost of part(s) in which tenderer has participated.

(iii) The work may have been executed by the tenderer as prime contractor or as a member of joint venture or sub contractor. In case project has been executed by a joint venture, weightage towards experience of the project would be given to each member in proportion to their participation in the joint venture.

(iv) ** Substantially completed works means those works which are 90% completed on the date of submission (i.e. gross value of work done up to the last date of submission is 90% or more of the original contract price) and continuing satisfactorily.

(v) Completion cost of works shall be brought to common base date of receipt of tender as per following formula:

Completion cost X (1 + (Period in days from date of completion to date of receipt of tender/365 days) X 0.1))

(vi) Available Bid capacity will be calculated as under

Available Bid Capacity = 2.5 x A x N – B

A.- Maximum value of all civil Engineering works in any one year during the last 5 financial years (Updated to the current price level with enhancement factor as given below) :-

Year	**Multiplying factor**
Last first year	1.10
Last second year	1.20
Last third year	1.30
Last fourth year	1.40
Last fifth year	1.50

N- Number of years prescribed for completion of work for which the current bid is invited.
B- Value of the balance ongoing works to be executed in period N.

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(vii) The tenderers shall indicate actual figures of completion cost of work and value of A without any enhancement as stated above.

(viii) To determine the altitude of work, average of minimum and maximum altitudes of the work site shall be considered.

(ix) No extension of time shall be given on account of delays in arranging/deploying and breakdown of requisite equipments, plants and vehicles and also due to delays in obtaining clearances for installation of hot mix plant if work is awarded to tenderer.

(x) Immovable property shall be exclusively in the name of contractor/Company and not in the name of family members/relatives/others. In case of Limited Companies, these should also be reflected in Balance Sheet.

(xi) **Relaxation may be given in any one criteria (except in criterias of Experience and performance & other requirements) up to 25% extent** i.e ABC may be permitted up to 75% of estimated cost of work/VEP may be permitted upto 75% of total Nos of requisite VEP/Working capital may be permitted upto 75% of requirement/Immovable property may be permitted up to 75% of requirement/Engineering establishment may be permitted upto 75% of requirement. No relaxation shall be permitted in criterias of Experience and performance & other requirements.

(xii) The tenderer may be afforded an opportunity to clarify or modify his qualification documents, if necessary, with respect to any rectifiable defects. The tenderer will respond in not more than 15 days of issue of the clarification letter, failing to which his tender is liable to be rejected.

(B) **JOINT VENTURE (JV) :-** Joint ventures are permitted for Bridge works with estimated cost more than Rs.10 crores and for other works with estimated cost more than Rs.25 crores. Number of partners in Joint ventures shall not be more than three. Evaluation shall be done as under :-

Criteria	Method of evaluation
Experience	All partners of JV must satisfy collectively.
Available bid capacity Immovable property	Each partner of JV should meet the criteria in proportion of shares of partners in JV. For example, if any partner has 40% share in JV, he should have available bid capacity more than 40% of estimated cost of work and minimum immovable property equal to 40% of 10% i.e. 4% of estimated cost of work,
Vehicles, Equipments and Plants Working capital Engineering Establishment for execution contracts	All partners of JV must satisfy collectively,
Performance and other requirements	All partners of JV must satisfy individually.

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Bid shall be signed so as to legally bind all partners of JV, jointly and severally, and shall be submitted with a copy of the joint venture agreement providing the 'joint and several' liability with respect to the contract. **Relaxation as per note (A) (xi) as stated above shall not be permissible in case of JV.** Payment shall be made either in the name of JV or in the name of lead partner only.

(C) **Disqualification**

(i) Even though the tenderers meet the above criteria, they are liable to be disqualified if they have made misleading or false information in bidding documents submitted.

(ii) Price bid of the subject tender may not be opened if the tenderer is found to be over loaded with respect to his upper tendering limit as per his registered class on the discretion of Accepting Officer (i.e., 5 times in normal and 7 times for exceptional cases of upper tendering limit of the registered class).

5.2.5 **List & format of eligibility documents to be attached alongwith Part-I of tender documents to prove eligibility :-**

(i) List of works completed/substantially completed in "last seven and current" financial years and ongoing works in following format :-

(a) Name of work & CA No. (b) Brief scope of work (c) Name & address of employer/client (d) Accepted contract amount (e) Date of commencement of work (f) Original date of completion (g) Extended date of completion (h) Actual date of completion/present progress (j) Cost of completed work (k) Remarks explaining reasons of delay if any.

Note : Works proving eligibility criteria of experience shall be highlighted and performance certificate from client in respect of these works shall be submitted.

(ii) **Available Bid capacity :**

For -A :- Balance sheets/certificates from chartered Accountant indicating annual turnover of civil Engineering works constructed in last 5 years.

For-B: - Contractors shall submit details of ongoing works as per format stated here-in-before.

Tenderers shall calculate ABC and submit details duly signed.

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(iii) **Equipments, Plants and Vehicles**:

(a) Tenderer shall indicate source of requisite Equipments, Plants and vehicles in good working condition required for execution of work in following format :-

(i) Item
(ii) Year of manufacture
(iii) Source from where to be arranged (owned/leased etc)
(iv) Location presently deployed
(v) Based on known commitments, whether will be available for use in the proposed contract.

(b) Copy of documentary support of ownership/assured access to the satisfaction of the Accepting officer

(iv) **Performance and other requirements**. Tenderer shall submit undertaking that:-

(a) There is no poor/slow progress in running works. (If yes he will submit details and reasons of delay to check that these are not attributable to him or are beyond his control).

(b) There are no serious defects observed in works which stand unrectified (If yes he will submit details and reasons).

(c) There are no cancelled/abandoned contracts in which Govt. unrealized recoveries exist (If yes he will submit details and reasons).

(d) He/They have not been blacklisted by any Govt. Deptt (If yes he will submit details and reasons).

(e) There are no any Govt. dues outstanding against the firm (If yes he will submit details and reasons).

(f) Proprietor/partners/directors of firm are not involved in anti national/social activities and have neither been convicted nor are any proceedings pending in court for such activities (If yes he will submit details).

(v) Tenderer shall submit information of all arbitration/court cases decided during last five & current financial years and also presently in progress as per following format :-

(a) Name & address of employer.
(b) Cause of dispute.
(c) Amounts involved
(d) Brief of Court judgment/arbitration award (if published) otherwise present progress.

(vi) **Working capital :-**

Copy of Latest balance sheet/income tax return for working capital and/or Banker's certificate for credit facilities. If necessary Department will make inquiries with the tenderer's Banker.

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(vii) **Immovable property :-**

Tenderer shall submit Affidavit for immovable property incorporating following certificates in affidavit along with valuation report from Registered (with any Govt body) valuer & registration certificate with any Govt body of required valuer :-

(a) That the immovable property is free from mortgages, hypothecation or any other disputes and encumbrances and clearly belongs to the Contractor.

Or

That the immovable property is free from any disputes and encumbrances and clearly belongs to the Contractor. The immovable property has been mortgaged/hypothecated for Rs……. Market value of immovable property as per valuation report given by Registered valuer is Rs……. Therefore Residual market value of property i.e. Rs……. (market value minus mortgaged value) is free from any mortgage/hypothecation

(b) That the said immovable property has not been shown for seeking enlistment of a sister concern in BRO.

(c) That the said immovable property will not be sold, transferred, gifted or otherwise disposed off till satisfactory completion of the work.

(viii) **Engineering Establishment** :

Tenderer shall submit list of Engineers on his permanent establishment with qualification & experience along with affidavits from requisite number of Engineers regarding employment with firm and copies of Degree/Diploma Certificates and experience certificate.

(ix) Constitution of firm along with copy of partnership deed (in case of partnership firms) and memorandum of articles and association (in case of limited companies).

(x) Copies of passport of proprietor/partners/directors (if available). If not submitted and Accepting officer has doubt in character and antecedents of proprietor/partners/directors he may get these verified from police authorities.

(xi) Copies of PAN Card of proprietor/partners/directors.

(xii) Lowest bidder (if his offer is decided for acceptance) will be required to fill enlistment form for provisional enlistment.

Notes:

(i) Documents as listed at Sl (vi) to (viii) **above are exempted for tenderers enlisted with BRO in eligible class * & above for works with estimated cost up to Rs.25 crores as given in NIT**.
(ii) Documents as listed at Sl (ix) to (xii) above are **exempted for tenderers enlisted with BRO in any class**.
(iii) Affidavits shall be submitted on Non-judicial stamp papers of appropriate values duly attested by the Magistrate/Notary Public.
(iv) Photocopies of documents shall be attested by Gazetted officer/public notary and also self attested.

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5.3 **The bidder should meet all the technical evaluation criteria indicated in the bid documents in order that the bid is considered to be technically responsive and the bidder qualifying to have its commercial Bid opened**.

6. **Part-II ('Price/commercial' – 'Q' Bid)**

6.1 Part-II 'Price/commercial Bid' – 'Q' Bid) shall comprise of the following :-

(i) Schedule-'A' Notes.
(ii) Schedule 'A' (to be quoted by Bidder)
(iii) Schedules 'B', 'C', & 'D'.
(iv) Tender page

6.2 **Q bid evaluation**

(i) Arithmetical corrections shall be made as per General condition of contracts **6(A)(A) of IAFW-2249.**

(ii) Commercial bids will be reviewed to ensure that the figures indicated therein are consistent with the details of the corresponding Technical bids.

(iii) For the purpose of evaluation "cost" shall be inclusive of all taxes and duties.

(iv) Cost of all items of Schedule A shall be totaled and the bidder who has quoted lowest total cost in Schedule A (L-1) shall be considered successful bidder and all other bidders shall be considered unsuccessful. Offer of successful bidder (L-1) shall only be considered for acceptance. If L-1 backs out, re-tendering shall be resorted in a fair and transparent manner.

6.3 Commercial Evaluation

(i) Any arithmetical errors shall be corrected including any discrepancy in works and figures when the amount expressed in words shall be treated as final.

(ii) Commercial Bids will be reviewed to ensure that the figures indicated therein are consistent with the details of the corresponding Technical Bids. It shall be ensured that all commercial terms and conditions including payment terms and the delivery schedule as indicated in the tender document have been adhered to.

(iii) For the purpose of evaluation, cost shall be inclusive of taxes and duties. The ultimate cost to the BRO at delivery site should be the deciding factor for determining the lower bidder (L1).

(iv) Whether L1 would be decided on the basis of individual items or all of them taken together would be required to be clearely specified in the tender document.

7. All the tender documents (Part-I & Part-II) shall be submitted together at one stage but placed in separate sealed envelopes (supplied by the tenderer) duly marked Part I and Part II as stated above. All the two envelopes containing Part I and Part II duly sealed shall be put in one large size envelope (cloth lined, outer cover to be supplied by the tenderer). This outer cover shall indicate name of work, name of tenderer, last date and time of receipt of tender prominently.

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8. The tender documents (Part-I and Part-II) should be submitted/should be dropped in Tender Box kept at the office of Accepting Officer **HQ CE (P) Dantak, C/O 99 APO** before the date and time fixed for receipt of tender. The tender received after due date and time shall not be considered for acceptance. BRO shall not be responsible for any postal or other delay and shall not take care to ensure the submission of tender at place and time fixed for receipt of tender.

9. Tender shall be opened immediately after time indicated in Para 1 herein before in the presence of the tenderers or their authorized representative whoever wish to be present. Part-I only shall be opened first **on 01 Apr 2021 at 1130 hrs (BST)**. Part II (Priced bid) shall not be opened. Part II (Price bid) envelopes shall be signed by the tender opening officers and some bidders present and shall be put in separate large envelope and sealed by the opening officers. Large envelop shall also be signed by the tender opening officers and some bidders present. This large size envelope containing unopened price bids shall be kept in safe custody of the officer nominated by the Accepting officer for this purpose. Part I (Technical Bid) will be evaluated as per technical evaluation criteria given in the tender documents. Unqualified tenders will also be informed and their Part II (Price Bid) shall be returned unopened separately. The date of opening of price bids will be intimated separately to the qualified firms and the Part II (Priced Bid as sealed in large size envelope) will be opened on the scheduled date in the presence of such tenderers who choose to be present and the amounts quoted by the tenderers shall be read out by the opening officer(s) to the tenderers.

10. The Chief Engineer Project Dantak, C/O 99 APO will be Accepting Officer here-in-after referred to as such for the purpose of this contract.

11. **Tenderers are requested to quote rates both in figure and words against each item of Schedule 'A' and extend the amount in Schedule 'A'.**

12. If tenderers desire that any condition or stipulation given in the tender documents is to be modified or deleted, they may submit their comments/suggestion well before last date of submission of tender for consideration by the Deptt for issue of corrigendum/amendments to tender documents. If deptt considers comments/suggestion suitable, corrigendum/ amendments to tender documents shall be issued and also uploaded on BRO web site. If deptt does not consider comments/suggestion suitable, corrigendum/amendments to tender documents shall not be issued/uploaded on BRO web site and tenderers shall quote strictly complying with the various provisions given in the tender documents. **Any tender which stipulates any alterations to any of the conditions/provisions laid down in tender documents (including corrigendum/ amendments) or which proposes any other conditions of any description whatsoever is liable to be rejected**.

13. The tenderers are advised to visit the work site to acquaint themselves of working and site conditions, before submitting their tender. The submission of tender by a person implies that he has read this tender forwarding letter, the conditions of contract and has made himself aware of the scope and specifications of the work to be done and of the conditions and other factors, site conditions, taxes & levies prevailing etc which may affect the quotation and execution of the work.

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14. Tenderer must be very careful to deliver a bonafide tender, failing which the tenders are liable to be rejected. Tenderers are, therefore, advised to ensure that their tender must satisfy each and every condition laid down in the tender documents.

15. Tenderers must ensure that their tender is unambiguous and is completed in all respects. Their particular attention is drawn to the following requirements, which must be complied with :-

(a) Tender documents are to be signed, dated and witnessed as provided for the purpose.

(b) All corrections should be signed or initialed. Use of correcting fluid is not allowed.

(c) Cloth lines envelope shall be used for returning the tender documents.

(d) In case they are submitting a BLANK TENDER word '**BLANK**' must be prominently endorsed on the envelope and in Schedule 'A' inside the tender documents and general summary duly signed by the tenderer.

(e) If a tender is submitted on behalf of a firm, it may be signed either by all partners or a person holding a valid power of attorney from all the partners constituting the firm. The person signing the tender on behalf of another or on behalf of a firm shall attach with tender a proper power of attorney duly executed in his favour by such other person or by all the partners stating specifically that he has authority to bind such other person(s) or the firm as the case may be in all matters pertaining to the contract including the arbitration clause. The power of attorney shall be executed as indicated below:-

(i) In case of proprietorship concern if tender is signed by other than proprietor, person signing tender documents should hold power of attorney from proprietor.

(ii) In case of partnership concern, power of attorney shall be executed by all partners.

(iii) In case of company, power of attorney shall be executed in accordance with the constitution of company.

(f) The undertaking is to be signed and attached by tenderer as per format given at Appx 'A'.

16. Tenderer who has downloaded the tender from the BRO website shall not temper/modify the tender form in any manner. In case if the same is found to be tempered/modified in any manner tender will be completely rejected and tenderer is liable to be banned from doing business with BRO.

17. Your attention is drawn to the Indian Official Secret Act-1923 (XIX of 1923) as amended upto date particularly Section 5 thereof.

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18 **Earnest Money** :-

Earnest money is not required to be attached with tender by the contractors, but contractor has to furnish Bid Security Declaration **(Amended vide GOI Min. of Finance OM No. F.9/4/2020-PPD dated 12 Nov 2020)** as per format given in Special Condition of the tender document

19. **Security Deposit** :- Deleted

20. **Performance security** :- Within 28 days of receipt of the letter of acceptance, the successful contractor shall deliver to the accepting Officer a Performance Security in any of the forms given below for an amount equivalent to **3%** of the Contract sum **(Amended vide GOI Min. of Finance OM No. F.9/4/2020-PPD dated 12 Nov 2020)**.

a) Bank Guarantee in the prescribed form issued by the nationalized banks/scheduled Indian banks but its confirmation shall be done only from the Head office of the bank.

b) FDR/Govt Securities

20.1 Failure of the sucssful contractor to comply with the requirement of above shall constitute sufficient ground for cancellation of the award of work and forfeiture of earnest money. In case enlishted contractor, the amount equal to earnest money shall be notified to the tenderer for depositing the amount through MRO, issue of tender to such tenderers shall remain suspended till aforesaid amount equal to the earnest money is deposited.

22. The Accepting Officer reserves the right to accept a tender submitted by a Public Undertaking, giving a purchase preference over other tender(s) as are admissible under the Government Policy. No claim for any compensation or otherwise shall be admissible to such tenders whose tenders may be rejected on account of the said policy.

23. In view of postal and other delays, it is suggested that your tender be posted sufficiently in advance of the last date fixed for receipt of tenders or sent through a special messenger, if necessary. Tender received late will not be considered. Telegraphic communications received in connection with this tender will also be not considered.

24. The tender shall remain open for acceptance for a period of **One hundred twenty days (120 days)** from the date of opening of **Q bid (Priced bid).**

23. On acceptance of tender, the name of authorized representative (s) of the contractor who would be responsible for taking instructions from Engineer-in-Charge or its authorized representatives shall be intimated by the contractor within 7 days of issue of Acceptance letters.

25. **Revision/Modification of quoted price** :-

(a) The tenderer shall quote his rates on the Schedule 'A' and General Summary pages only. In case the tenderer has to revise/modify the rates quoted in the Schedule 'A' and/or General Summary before deposition in tender box, he may do so only in the Schedule 'A'/General Summary.

(b) In case of a tenderer has to revise/modify/withdraw his quoted rates/offer after it is deposited in Tender Box, he may do so on his letter head before the latest time fixed for submission of tenders and deposit in tender box in sealed/properly closed cover only. Any revision/modification in offer/withdrawal of offer in the form of an open letter shall not be taken into account, while considering his originally quoted offer.

EE(C)
SW
For Accepting Officer

(Signature of the Contractor)

(c) The tenderers shall not be permitted to revise/modify/withdraw price bid unopened after closure of the time fixed for receipt of tender.

25. **Revocation of offer** :- In the event of lowest tenderer revokes his offer or revise his rates upward (which will be treated as revocation of offer), after opening of tenders and before expiry of original validity period stipulated in tender documents, the earnest money deposited by him shall be forfeited. In case of BRO enlisted contractors, the amount equal to the earnest money stipulated in the Notice of tender, shall be notified to the tenderer for depositing the amount through MRO, failing which the amount shall be recovered from any payment due to such Contractor or shall be adjusted from the Standing Security Deposit. In addition, L-1 tenderer revoking offer and his related firms shall not be issued the tender in second or subsequent calls of subject work.

Enclosures : Tender Documents

EE(C)
SW
For Accepting Officer

(Signature of the Contractor)

Appendix 'A'
(Ref Para-15 (f) of Forwarding Letter)

UNDERTAKING BY AUTHORISED SIGNATORY

I, the undersigned do hereby under take that our firm M/s _____
_____
agree to abide by Terms and Conditions of subject Tender for **CONSTRUCTION OF 20 NOS OF 2 MTR SPAN RCC CULVERTS IN CONVENTIONAL METHOD AND PROVIDING AND LAYING OF WMM 100 MM AND 75 MM COMPACTED THICKNESS, DBM 60 MM COMPACTED THICKNESS AND BC 40 MM COMPACTED THICKNESS INCLUDING APPLICATION OF PRIME COAT, TACK COAT, ROLLING AND COMPACTION AS PER MORT&H SPECIFICATIONS AND ROAD MARKING WITH THERMOPLASTIC PAINT 2.50 MM THICK CONFORMING TO MOST 803.4 INCLUDING PREPARATION OF SURFACE FOR CARRYING OUT SURFACING WORKS BETWEEN KM 48.000 TO KM 53.000 ON CONFLUENCE - HAA ROAD UNDER 19 BRTF OF PROJECT DANTAK INSIDE BHUTAN.**from Page No. 01 to **220** is advertised on the **www.epublish.gov.in** and it shall be binding on us and may be accepted at any time before the expiration of stipulated tender conditions.

_____
(Signed by an Authorized Officer of the firm)

_____
Title of Officer

_____
Name of Firm

_____
Date

EE(C)
SW
For Accepting Officer

(Signature of the Contractor)

[In lieu of IAFW-1779-A (to be use in conjunction with General Conditions Of Contract based on and IAFW-2249) (1989 Print)]

CHIEF ENGINEER PROJECT DANTAK

http : //www.gref.gov.in
http : //www.bro.gov.in
E-mail : brodtk@gmail.com
Tele : **009752 - 351082/351086/351088**
Fax : **009752 – 351285**

Headquarters
Chief Engineer
Project Dantak
PIN : 931708
C/O 99 APO

80553/ /E8 Mar 2020

NAME OF WORK:	**NAME OF WORK : CONSTRUCTION OF 20 NOS OF 2 MTR SPAN RCC CULVERTS IN CONVENTIONAL METHOD AND PROVIDING AND LAYING OF WMM 100 MM AND 75 MM COMPACTED THICKNESS, DBM 60 MM COMPACTED THICKNESS AND BC 40 MM COMPACTED THICKNESS INCLUDING APPLICATION OF PRIME COAT, TACK COAT, ROLLING AND COMPACTION AS PER MORT&H SPECIFICATIONS AND ROAD MARKING WITH THERMOPLASTIC PAINT 2.50 MM THICK CONFORMING TO MOST 803.4 INCLUDING PREPARATION OF SURFACE FOR CARRYING OUT SURFACING WORKS BETWEEN KM 48.000 TO KM 53.000 ON CONFLUENCE - HAA ROAD UNDER 19 BRTF OF PROJECT DANTAK INSIDE BHUTAN.**

Dear Sir (s),

Messrs/Mr _____

of _____is/are hereby authorised to tender for the above work. The tender is to be delivered at the Office of the Chief Engineer, Project DANTAK, PIN 931708, C/O 99 APO or at OIC liaison cell located at HQ 19 BRTF, Jaigaon, Pin-930019, Ph 8145087696 **upto 1100 hrs (BST) on** **30 Mar 2021** addressed to Headquarters, Chief Engineer, Project Dantak, PIN – 931708, C/o 99 APO **CONSTRUCTION OF 20 NOS OF 2 MTR SPAN RCC CULVERTS IN CONVENTIONAL METHOD AND PROVIDING AND LAYING OF WMM 100 MM AND 75 MM COMPACTED THICKNESS, DBM 60 MM COMPACTED THICKNESS AND BC 40 MM COMPACTED THICKNESS INCLUDING APPLICATION OF PRIME COAT, TACK COAT, ROLLING AND COMPACTION AS PER MORT&H SPECIFICATIONS AND ROAD MARKING WITH THERMOPLASTIC PAINT 2.50 MM THICK CONFORMING TO MOST 803.4 INCLUDING PREPARATION OF SURFACE FOR CARRYING OUT SURFACING WORKS BETWEEN KM 48.000 TO KM 53.000 ON CONFLUENCE - HAA ROAD UNDER 19 BRTF OF PROJECT DANTAK INSIDE BHUTAN. to be opened on 01 Apr 2021at 1130 Hrs (BST).**

All documents must be returned whether or not a tender has been submitted.

Any correction concerning this tender should be addressed as indicated at the top of this sheet, quoting the reference as given.

THE PRESIDENT OF INDIA DOES NOT BIND HIMSELF TO ACCEPT THE LOWEST TENDER OR ANY TENDER

EE(C)
SW
For Accepting Officer

(Signature of the Contractor)

BORDER ROADS ORGANISATION
CHIEF ENGINEER PROJECT DANTAK
NOTICE INVITING TENDER- 04 /2020-21

1. A sealed tender is invited for "**CONSTRUCTION OF 20 NOS OF 2 MTR SPAN RCC CULVERTS IN CONVENTIONAL METHOD AND PROVIDING AND LAYING OF WMM 100 MM AND 75 MM COMPACTED THICKNESS, DBM 60 MM COMPACTED THICKNESS AND BC 40 MM COMPACTED THICKNESS INCLUDING APPLICATION OF PRIME COAT, TACK COAT, ROLLING AND COMPACTION AS PER MORT&H SPECIFICATIONS AND ROAD MARKING WITH THERMOPLASTIC PAINT 2.50 MM THICK CONFORMING TO MOST 803.4 INCLUDING PREPARATION OF SURFACE FOR CARRYING OUT SURFACING WORKS BETWEEN KM 48.000 TO KM 53.000 ON CONFLUENCE - HAA ROAD UNDER 19 BRTF OF PROJECT DANTAK INSIDE BHUTAN.**"

2. Tender documents may be downloaded from central public procurement portal site **http://eprocure.gov.in/eprocure/app,** BRO website www.bro.gov.in and CAB website www.cab.org.bt as per the schedule as given in **CRITICAL DATE SHEET** as under and printout is to be taken on A4 size paper. It is advisable that the downloaded tender document to be printed through laser printer preferably. Submission of photocopy of tender is not permitted.

CRITICAL DATE SHEET

01	Publishing date & time on CPPP website	09 Mar 2021 at 1200 Hrs
02	Bid document download start date	09 Mar 2021 at 1230 Hrs
03	Clarification start date & time (Pre Bid queries)	10 Mar 2021 at 1130 Hrs
04	Clarification end date & time	27 Mar 2021 at 1100 Hrs
05	Bid submission start date & time	10 Mar 2021 at 1130 Hrs
06	Bid submission end date & time	30 Mar 2021 at 1100 Hrs
07	Opening date & time of Technical bid	01 Apr 2021 at 1130 Hrs
08	Opening date of Financial bid	Will be intimated later

.

3. The estimated cost of work is **Rs 598.23 Lacs (Rupees Five Crore Ninety Eight Lacs Twenty Three only)** approximately or as subsequently amended in tender documents and uploaded in BRO website**.** This estimate, however, is not a guarantee and is merely given as a rough guide, and if work costs more or less, tenderer shall have no claim on that account of what so ever nature.

4. The tender shall be based on Specifications, **General Conditions of Contracts IAFW-2249 and item rate contract form based on IAFW 1779-A with Schedule "A"** (List of works) to be priced by tenderers.

5. Not more than one tender shall be submitted by one contractor or contractors having business relationship. Under no circumstances will a father or his son(s) or other close relations who have business relationship with one another (i.e. when one or more partner(s)/director(s) are common), be allowed to tender for the same contract as separate competitors. A breach of this condition will render the tenders of both the parties liable to rejection.

6. The work is to be completed within **365 days** or as subsequently amended in tender documents or uploaded on central public procurement portal site **http://eprocure.gov.in/eprocure/app,** BRO website www.bro.gov.in and CAB website www.cab.org.bt in accordance with the phasing, if any, indicated in the tender from the date of handing over the site, which will be generally within one month from the date of issue of Acceptance letter.

7. **The Chief Engineer (P) Dantak**, **C/O 99 APO will be Accepting Officer** hereinafter, referred to as such for the purpose of this contract.

EE(C)
SW
For Accepting Officer

(Signature of the Contractor)

NOTICE INVITING TENDER (CONTD)

8. Tender (in full) either downloaded from CPP Portal website will be received at HQ CE (P) Dantak , C/o 99 APO or at OIC liaison cell located at HQ 19 BRTF, Jaigaon, Pin-930019, Ph 8145087696/9643800181 at **1100 hrs (BST) on 30 Mar 2021**. Part - I un-priced bid will be opened on **01 Apr 2021** at **1130 hrs (BST)**. Tender received after due date shall not be considered for opening and no reason for delay or claim whatsoever shall be entertained.

9. Intending tenderers are advised to visit central public procurement portal site **http://eprocure.gov.in/eprocure/app,** BRO website www.bro.gov.in and CAB website www.cab.org.bt three days prior to date of opening of tender for any corrigendum/addendum/amendment.

10. Earnest money is not required to be attached with tender by the contractors, but contractor has to furnish Bid Security Declaration **(Amended vide GOI Min. of Finance OM No. F.9/4/2020-PPD dated 12 Nov 2020)** as per format given in Special Condition of the tender document..

11. ***Successful Bidder (L-1) shall deposit to Accepting Officer a Performance Security for an amount of 3% of contract sum (Amended vide GOI Min. of Finance OM No. F.9/4/2020-PPD dated 12 Nov 2020) in the shape of Bank Guarantee or FDR within 28 days of issue of LoA.***

12. Copies of drawings (if applicable) and other documents pertaining to the work (signed for the purpose of identification by the Accepting Officer or his accredited representative) and sample of materials and stores to be supplied by the contractor will be opened for inspection at the following locations:-

Chief Engineer (P) Dantak, C/o 99 APO

13. The tenderer are advised to visit the site by making prior appointment with Commander, 19 Border Roads Task Force, C/o 99 APO sufficiently in advance (Telephone No of Commander,19 BRTF at **009755- 252201)**. A tenderer shall be deemed to have full knowledge of all relevant documents, local conditions, sites etc. For further details tenderer may contact telephonically if required, SW, Project DANTAK at **009752 – 351082/351086** during office hours.

14. A tenderer shall be deemed to have full knowledge of all relevant documents, samples, site etc whether he has inspected them or not.

15. Any qualification documents/tender which stipulates any alterations to any of the conditions laid down or proposes any other conditions of any description what so ever, is liable to be rejected.

16. The Accepting Officer reserves his right to accept a tender submitted by a public undertaking, giving a price preference over other tender (s) which may be lower, as are admissible under the Govt. policy. No claim for any compensation or otherwise shall be admissible from such tenderer (s) whose tenders may be rejected on account of the said policy.

17. The submission of tender by a tenderer implies that he had read this notice and conditions of contract and has made himself aware of the scope and specifications of the work to be done and of the conditions rates at which stores, tools and plants etc will be issued to him, local conditions and other factors bearing on the execution of the work

18. Blank.

19. The hard copy of original instruments in respect of earnest money, under taking regarding acceptance of tender conditions, Enlistment letter if firm is enlisted in BRO, EPFO, Registration letter, GST Registration and any other document required to be submitted with respect to various conditions mentioned in the tender documents should be attached with tender documents

EE(C)
SW
For Accepting Officer

(Signature of the Contractor)

NOTICE INVITING TENDER (CONTD)

20. Blank.

21. Blank.

.

22. Blank.

23. In case of rejection of technical bid, contractor may appeal to next higher engineer authority i.e. HQ DGBR on email bro-e8@nic.in with copy to the Accepting Officer i.e. CE on email bro-dtk@nic.in against rejection within 05 days from the date of publishing of result of technical bid qualification on CPP Portal whose decision shall be final and binding. If the appeal is not made within this period, the bidder shall forfeit his right of appeal against rejection of his technical bid. Any appeal received after 05 days of such publication of result shall not be entertained under any circumstances. The next higher engineering authority shall preferably try to resolve the issue within 05 days of such representation. However, contractor/bidder shall not be entitled for any compensation whatsoever on account of rejection of technical bid.

24. For any further particulars, you may refer central public procurement portal site **http://eprocure.gov.in/eprocure/app,** BRO website www.bro.gov.in and CAB website www.cab.org.bt.

25. Blank.

26. In the event of lowest tenderer revoking his offer or revising his rates upward (which will be treated as revocation of offer), after opening of tenders, the earnest money deposited by him shall be forfeited. In case of BRO enlisted contractors, the amount equal to the earnest money stipulated in the Notice of tender, shall be notified to the tenderer for depositing the amount through MRO, failing which the amount shall be recovered from payment due to such Contractor or shall be adjusted from the Standing Security Deposit. In addition, such tenderer and his related firm shall not be issued the tender in second or subsequent calls.

27. Important- Above particulars may change due to Administrative or any other reasons and shall be available in central public procurement portal site **http://eprocure.gov.in/eprocure/app,** BRO website www.bro.gov.in and CAB website www.cab.org.bt Therefore, bidders/contractors are requested to visit central public procurement portal site **http://eprocure.gov.in/eprocure/app,** BRO website www.bro.gov.in and CAB website www.cab.org.bt frequently and at least once again 03 (three) days prior to bid submission date as per critical date sheet, for any changes in above particulars.

28. Blank

29. The tender shall remain open for acceptance for a period of **120 days** from bid submission date.

30. The tender may be accepted as whole.

31. This notice of tender shall form part of the contract.

No.80553/ /E8
Headquarter
Cheif Engineer
Project Dantak
PIN : 931 708
C/O 99 APO

EE (Civ)
For Accepting Officer
Dated : Mar 2021

NAME OF WORK:	**CONSTRUCTION OF 20 NOS OF 2 MTR SPAN RCC CULVERTS IN CONVENTIONAL METHOD AND PROVIDING AND LAYING OF WMM 100 MM AND 75 MM COMPACTED THICKNESS, DBM 60 MM COMPACTED THICKNESS AND BC 40 MM COMPACTED THICKNESS INCLUDING APPLICATION OF PRIME COAT, TACK COAT, ROLLING AND COMPACTION AS PER MORT&H SPECIFICATIONS AND ROAD MARKING WITH THERMOPLASTIC PAINT 2.50 MM THICK CONFORMING TO MOST 803.4 INCLUDING PREPARATION OF SURFACE FOR CARRYING OUT SURFACING WORKS BETWEEN KM 48.000 TO KM 53.000 ON CONFLUENCE - HAA ROAD UNDER 19 BRTF OF PROJECT DANTAK INSIDE BHUTAN.**

GENERAL CONDITION OF CONTRACTS
IAFW –2249: 1989 PRINT
FOR
ITEM RATE CONTRACTS (IAFW-1779 A)

1. A copy of General Conditions of Contract (IAFW-2249: Print 1989) with Errata 1 to 20 and Amendments Nos. 1 to 48 is in my/our possession. I/we has/have read and understood the provisions contained in the aforesaid GENERAL CONDITIONS OF CONTRACT before submission of this tender and I/we agree that I/we shall abide by the terms and conditions thereof.

2. It is hereby further agreed and declared by me/us that the GENERAL CONDITIONS OF CONTRACT, including Condition No. 70 thereof pertaining to the settlement of disputes by Arbitration (IAFW-2249) and Condition No No 71 pertaining to appointment of Dispute resolution Board shall form part of this tender documents.

3. Wherever the phrases Commander Works Engineer (CWE) and Garrison Engineer (GE) have been used in the General Conditions of Contract (IAFW-2249) the same are considered as Task Force Commander (TFC) and OC Contract respectively as applicable in Border Roads Organisation..

4. This tender submitted by me/us is subject to the aforesaid General condition of contract IAFW-2249, errata and amended copy of which is in my/our possession and which I/we have read and fully understood before submission of tender.

5. My/our signature here under is in token of my/our having accepted the aforesaid amended General conditions of contract including errata & amendments there to (IAFW-2249) and the clause relating to arbitration forming as integral part of this tender.

Note: - Serial Page numbers 22 to 118 (General conditions of contract for execution of works IAFW-2249) will be enclosed with the accepted tender only. However copy of General Condition of Contracts IAFW-2249 can be referred in the office of HQ CE (P) Danntak/HQ 19 BRTF (GREF), if required.

EE(C)
SW
For Accepting Officer

(Signature of the Contractor)

SPECIAL CONDITIONS

CONSTRUCTION OF 20 NOS OF 2 MTR SPAN RCC CULVERTS IN CONVENTIONAL METHOD AND PROVIDING AND LAYING OF WMM 100 MM AND 75 MM COMPACTED THICKNESS, DBM 60 MM COMPACTED THICKNESS AND BC 40 MM COMPACTED THICKNESS INCLUDING APPLICATION OF PRIME COAT, TACK COAT, ROLLING AND COMPACTION AS PER MORT&H SPECIFICATIONS AND ROAD MARKING WITH THERMOPLASTIC PAINT 2.50 MM THICK CONFORMING TO MOST 803.4 INCLUDING PREPARATION OF SURFACE FOR CARRYING OUT SURFACING WORKS BETWEEN KM 48.000 TO KM 53.000 ON CONFLUENCE - HAA ROAD UNDER 19 BRTF OF PROJECT DANTAK INSIDE BHUTAN.

1. GENERAL

The following Special Conditions shall be read in conjunction with General Conditions of contracts **IAFW-2249**, including amendments thereto, and whereas variation exists the Special Conditions shall take precedence over the aforesaid General Conditions.

The Special Conditions given in succeeding paragraphs shall be read in conjunction with Schedule A, technical specifications and General Conditions of Contracts IAFW-2249. In case of any discrepancies in the various provisions of the contract, the following order of precedence shall be observed:-

(a) Description given in Schedule 'A'.
(b) Particular/Technical Specifications.
(c) Drawings and sketches.
(d) Ministry of Road Transport & Highways (MoRTH) specifications for Road and bridge works published by Indian Roads Congress New Delhi (Vth Revision).
(e) Special conditions.
(f) General conditions of contracts.

2. INSPECTION OF SITES

The contractor is particularly advised to inspect the site (s) of work by making prior appointment with the **Chief Engineer Project Dantak, C/o 99 APO/Commander 19 BRTF, C/o 99 APO** so as to acquint himself with regard to the nature and conditions of site, nature and means of local communication, working hours, conditions of access and all other cognate matters concerning the execution and completion of the work. Any paths, tracks, approaches etc, required for the movement of plants, equipments, machines and vehicles etc to the work site and plate form, bund etc required for the execution of work will be responsibility of the contractor and rates quoted must include these aspects also where required. The tenderer shall be deemed to have inspected the site and made himself familiar with various factors which may affect his quotation where he actually inspects the site or not. No extra charges consequent on misunderstanding or otherwise will be allowed.

3. LAND FOR OFFICES ETC

The contractor shall have to make his/her own arrangements for the land as may be required by him/her for housing of staff and labour and for erection of store sheds, offices, godowns etc., required by him/her for this work. The contractor must ensure that the staff, labour, plant, equipments, machines, vehicles, stores etc., employed or collected in connection with the work are so located that there is no hindrance to free flow of traffic on the roads/highway. Suitable cautionary and warning signs and other measures are to be installed/provided by the contractor at his own cost for the safety of traffic.

EE(C)
SW
(Signature of the Contractor) For Accepting Officer

SPECIAL CONDITIONS (CONTD)

4. MINIMUM FAIR WAGES PAYMENT TO LABOUR

(a) The contractor shall pay wages not less than the minimum fair wages fixed from time to time by the Central Govt/State Govt/Local Authorities. He shall have no claim whatsoever, if on account of any local regulations and/or otherwise, he is required to pay wages in excess of the wages so fixed.

(b) The contractor shall observe the laws/regulations applicable in the area regarding the employment of labour, payment of wages and other cognate matters relating to the conditions.

(a) In case local labourers are not available, the contractor may have to obtain written permit from the appropriate authority of State Govt. to import labour from outside the state.

(d). The contractor shall ensure compliance to all the labour wages laws and benefit rules for the labour employed by him.

(e) The contractor shall maintain muster roll of labourer engaged in the work along with wages being paid to labourer (trade wise). The muster roll shall be available at site for inspection by Engineer-in-Charge or any authorized Govt. Officials.

5. ROYALTIES. The Contractor shall make his own arrangement for procuring materials required under the contract and he shall ensure that the royalty for the material procured by him under this CA has been correctly paid to the concerned authority. Any claim of royalty by the concerned department on the material procured under this CA shall be settled with concerned authority directly by Contractor. Further the contractor should ensure that the supply of material is not arranged illegally. An undertaking to this account will be given by contractor before payment of RAR/Final bill

SPECIMEN COPY OF UNDERTAKING

I / We, M/s _____hereby declare that I /We have supplied the following materials against CA No. CE (P) Dantak/ / 2020-21 during the period from _____ to _____.

Srl No.	Materials	Gross Quantity supplied
(a)		
(b)		
(c)		

It is further certified that the royalty for the above quantity of materials at the applicable rates have been paid by us to the concerned department of the Govt.

(M/s _____)

.

EE(C)
SW
For Accepting Officer

(Signature of the Contractor)

SPECIAL CONDITIONS (CONTD)

6. BLASTING ROCKS

(a) The contractor shall be responsible for the safe custody and storage of blasting materials in accordance with the rules on the subject. Written authority of the Engineer-in-Charge/OC Contract shall be obtained before any blasting operations are commenced.

(b) The contractor shall ensure that the charges in blasting are not excessive and that the charged bore holes are properly protected before firing and that proper precautions are taken for the safety of men and property.

(c) Blasting should be generally avoided. In case it is unavoidable less charge controlled blasting may be resorted with the prior permission of the Engineer-in-Charge/OC Contract. The contractor shall be bound to abide by the instructions of the Engineer-in-Charge/OC Contract Contract regarding the necessity of blasting and the type, number size and pattern of holes to be drilled and also the type , amount and method of firing of explosive to be used. The Engineer-in-Charge/OC Contract t shall reserve the right to restrict the number of charge to be fired at a time so that the hillside is not adversely affected. The contractor shall fire the charges only at such time as approved by the Engineer-in-Charge/OC Contract and shall have no claim, whatsoever, on account of any delay and extra cost due to carrying out the instructions of the Engineer-in-Charge/OC Contract and / or taking the safety precautions directed by him.

7. MOVEMENT OF CONTRACTOR VEHICLES

7.1. Minimum classification of existing bridges on the roads are Class 70 R bridges, contractor should not bring any heavier vehicle/plnt/equipment as such vehicle/plant/equipment shall not be allowed on the bridges. The contractor's vehicle may be required to ply in convoys as per directions given by the concerned Civil/Military authorities. No extra payment/time will be admissible on this account.

7.2. In case the condition of these bridges warrant further downwards load classification due to any unforeseen circumstances, the same will be done by OC Contract whose decision shall be final and binding. In case of any such eventuality, the contractor may have to unload his heavy load carried at locations, indicated to suit the load classification indicated by the OC Contract. Any such heavy load carriage thus necessitated across such indicated bridge(s) shall have to be done by the contractor without any additional payment and no claim whatsoever on this account will be entertained.

8. SECURITY RESTRICTIONS

8.1 Contractor intention is invited to condition 25 of IAFW-2249 contractor shall employ only Indian National/Bhutanese after verifying their antecedents and loyalty. The contractor shall on demand by the Engineer-in-Charge / OC Contract, submit list of his agents, employees and work people concerned and shall satisfy the Engineer-in-Charge / OC Contract as to the bonafide credential of such people.

8.2 The contractor and his workmen shall observe all the rules promulgated by the authority controlling the area in which work is to be carried out e.g. prohibition of smoking, lighting, fire precautions, search of persons on entry and exit, keeping to specified routes and restricted hours of work etc. Thorough search of all persons and transport may be conducted by the departmental authorities at the site of works at any time and any number of times for security reasons Necessary Permits are to be obtained from Civil Authorities by the contractor, for himself, his staff and labour. Nothing shall be paid extra on this account. During currency of the contract, if anybody is suspected to have any connection with anti-national elements/activities, he will immediately be removed and contractor shall have no claim whatsoever on this account.

EE (C)
SW
For Accepting Officer

(Signature of the Contractor)

SPECIAL CONDITIONS (CONTD)

8.3 Necessary assistance will be extended to the contractor by the department for providing passes / permits to the contractor, his representatives and workmen to enter the State.

8.4 In case of accident during transit and hiring period and subsequent claims by pers/agency/Deptt involved in the accident, responsibility of pursuing court case/compensation cases will rest with the contractor.

8.5 In case of total loss of the eqpt due to any reasons, natural or otherwise whatsoever, the loss will be borne by the contractor.

9. FREE ACCESS TO SITES AND LOOKING AFTER OF WORKS

The contractor shall give all reasonable facilities to this department personal for the inspection of the works being executed under this contract. He will also provide free access to the works if being executed by this department or other agencies and if such works are located near the sites covered under this contract. Responsibility of all the works covered in this contract will lie on the contractor and these works will be fully completed and accordingly handed over to this department.

10. **TAXES ETC**

The tendered amount shall inter-alia be deemed to be inclusive of all taxes, viz work Contract Tax, terminal taxes, toll taxes, Royalty, octroi, **GST**, sale tax/VAT, Service Tax, or any other taxes and the like levies payable under the respective existing country/states etc. No claim on account of any taxes will be payable to contractor whatsoever except as provided in sub Para 11 (b) here-in-after.

10.1 **GST/Sales Tax are not applicable for Project Dantak**. For any query regarding **exemption of GST** on import of goods and services **from India to Bhutan**, kindly refer to the following websites for detail information.

(aa) www.cbec.gov.in//htdocs-cbec/gst/index.
(ab) www.cbec.gov.in/resources//htdocs-cbec/gst/notfctn-42-igst-rate-english.pdf.
(ac) www.cbec.gov.in/resources//htdocs-cbec/gst/notfctn-300CGST-rate-english.pdf.

10.2 **For Indian Supplier only**. As supply to Project Dantak located outside India, no GST is applicable. Indian Supplier / Bidder shall attach undertaking certificate as per the following format mandatorily :-

UNDERTAKING CERTIFICATE

"It is certified that the goods / materials given in the CA No_____ of HQ CE (P) Dantak will be supplied by me / our firm as export and for use in Bhutan. It is declared that no GST cost has been included by me in the rates quoted in above mentioned enquiry".

Signature with date :

Name of the bidder :

Name of firm with address :

Certificate on account of GST as per Rule No 16 (1) of IGST Act 2017 will be issued on receipt of stores as format of certificate is as given under:-

EE (C)
SW
For Accepting Officer

(Signature of the Contractor)

SPECIAL CONDITIONS (CONTD)

GST : ZERO RATED SUPPLY CERTIFICATE

1. It is certified that the goods supplied by your firm against CA No_____ for the cost of Rs. _____/- (Rupees _____only) is a zero rated Supply as per **GST Rule No 16 (1)** of **IGST Act 2017** as the goods were supplied as an export and to be used in Bhutan by this Project.

2. It is further certified that no amount was paid to your firm by this Project on account of GST

Consignee Unit

Indian firms may refer to rule 16 of IGST Act 2017 and Notification No. 42/2017-Integrated Tax (Rate) Ministry of Finance dated 27 Oct 2017.

11. RE-IMBURSEMENT/REFUND ON VARIATION IN "TAXES DIRECTLY RELATED TO CONTRACT VALUE"(As per latest policy dated 24228/DGBR/Policy Instr/2017/100/E8 dated 25 Aug 2017)

(a) The rates quoted by the contractor shall be deemed to be inclusive of all taxes, (including GST on materials, GST on Work Contracts, turnover tax, Labour Welfare cess /tax Ecological and Environment cess etc**),** duties, Royalties, Octroi & other levies payable under the respective statutes. No re-imbursement /refund for variation in rates of taxes, duties royalties, Octroi & other levies, and / or imposition / abolition of any new/existing taxes, duties, royalties, Octroi & other levies shall be made except as provided in sub Para (b) here-in-below:-

(b) (i) The taxes which are levied by Govt. at certain percentage rates of Contract Sum / Amount shall be termed as "taxes directly related to contract value" such as GST on works contracts, turnover tax, Labour Welfare Cess /Tax and like but excluding Income Tax. The tendered rates shall be deemed to be inclusive of all "taxes directly related to contract value" with existing percentage rates as prevailing on last due date for receipt of tenders. Any increase in percentage rates of 'taxes directly related to contract value" with reference to prevailing rates on last due date for receipt of tenders shall be reimbursed to the contractor and any decrease in percentage rates of 'taxes directly related to contract value" with reference to prevailing rates on last due date for receipt of tenders shall be refunded by the contractor to the Govt. / deducted by the Govt. from any payment due to the contractor. Similarly imposition of any new "taxes directly related to contract value" after the last due date for receipt of tenders shall be reimbursed to the contractor and abolition of any "taxes directly related to contract value" prevailing on last due date for receipt of tenders shall be refunded by the contractor to the Govt. /deducted by the Govt. from the payments due to the contractor.

(b) (ii) The contractor shall, within a reasonable time of his becoming aware of variation in percentage rates and/or imposition of any "taxes directly related to contract value" give written notice thereof to the OC Contract stating that the same is given pursuant to this Special Condition, together with all information relating thereto which he may be in a position to supply. The contractors shall submit the other documentary poof /information as the OC may require.

(b) (iii) The contractor shall, for the purpose of this condition keep such books of account and other documents as are necessary and shall allow inspection of the same by a duly authorized representative of Govt., and shall further, at the request of the OC furnish, verified in such a manner as the OC Contract may require, any documents so kept and such other information as the OC may require.

EE (C)
SW
For Accepting Officer

(Signature of the Contractor)

SPECIAL CONDITIONS (CONTD)

(b) (iv) Reimbursement for increase in percentage rates /imposition of "taxes directly related to contract value" shall be made only if the contractor necessarily & properly pays additional "taxes directly related to contract value" to the Govt. without getting the same adjusted , against any other tax liability or without getting the same refunded from the concerned Govt. Authority and submits documentary proof for the same as the OC may require".

12. SECURITY OF DOCUMENTS

The contractor shall not communicate any classified information regarding works/organisation either to the sub contractor or others without prior approval of the Engineer-in-Charge. Any violation on this aspect will be forfeit the right of the contractor to claim any amount due to the contractor whatsoever held with organisation.

13. FOREGION EXCHANGE/IMPORT LICENCE

No foreign exchange and/or import license will be arranged by the Department in the connection of work under this contract.

14. CONTRACTOR'S VEHICLES/PLANT AND EQUIPMENT AT SITE

(a) The contractor shall furnish to the Engineer-in-Charge a distribution return of his plant/equipment on the site of works, stating the following particulars: -

i) Particulars of Plant/equipment i.e. Make, Manufacture's No, Model No, if any, Registration No, if any, capacity, yearn of manufacture, year of purchase etc.

ii) Total quantity on site of work.

iii) Location indicating quantity at the site of work.

(b) For the purpose of this condition, plant/equipment shall include vehicles, trucks, Cranes, Heavy Lifting Equipment, Welding Machine, Gas cutter and lorries but not the workmen's tools and/or any manually operated tools/equipment.

(c) The Engineer-in-Charge shall record the particulars supplied by the contractor as aforesaid, in the works diary and send a return to OC Contract for record in his office.

(d) The first return shall be submitted immediately after any plant or equipment is brought to the site. Thereafter every week changes in the return shall be furnished in the following form: -

S/No	Particulars of plant/ equipment	Total No at site of work	Location	Remarks

Addition Since……..
Reduction Since……..

(e) A complete return showing the upto-date position of plant/equipment at site shall be submitted on 15th of every month till the works are completed and the site cleared.

(f) The contractor's attention is invited to condition 34 of General Conditions of Contracts according to which no tool, plant/equipment shall be removed off the site without written approval of the OC Contract.

EE (C)
SW
For Accepting Officer

(Signature of the Contractor)

SPECIAL CONDITIONS (CONTD)

15. FIXING OF PERMANENT AND TEMPORARY BENCH MARKS:

Pmt Bench Mark be fixed at any nearby safe location or considered from any existing Permanent Building. RL be transferred and TBM be fixed at an interval of appx 200 mtr along the existing alignment at safe place. These temp Bench Marks should remain intact till completion of the work.

16. TOTAL STATION EQUIPMENT:

The total station eqpt with its accessories be provided by the contractor and will remain at site till completion of job.

17. Blank

18. Blank

19. FOSSILS

19.1 All fossils, coins, articles of value or antiquity, and structures and other remains or items of geological or archaeological interest found on the site shall be placed under the care and authority of the Employer. The contractor shall take reasonable precautions to prevent Contractor's Personnel or other persons from removing or damaging any these findings.

19.2 The Contractor shall, upon discovery of any such finding, promptly give notice to the Engineer-in-Charge/OC Contract, who shall issue instructions for dealing with it. If the Contractor suffers delay and/or incurs Cost from complying with the instructions, the Contractor shall give a further notice the Engineer- in-Charge/ OC Contract describing in detail the delay sustained by him and cost measured by him for following the instructions of the Engineer-in-Charge/OC Contract in dealing with the fossils along with all supporting documents/proof, within 7 days of the occurrence. The Contractor then be certified for the following:-

(a) An extension of time for any such delay, if completion is or will be delayed due to such act in following the instructions of the Engineer-in-Charge/OC Contract.

(b) Payment of any such cost, which shall be included in the Contract Price.

19.3 After receiving this further notice, the Engineer-in-Charge/OC Contract shall examine the case with facts and figures and disagreements if any will be communicated to the contractor.

19.4 In case of any disputes, the matter shall be referred to the Accepting Officer whose decision shall be final and binding.

20. TIME AND PROGRESS CHART

(a) The time and progress chart to be prepared as per the General Condition of Contract shall consist of detailed network analysis and a time schedule. The critical path network will be drawn jointly by the OC Contract and the Contractor soon after acceptance of the Tender. The time scheduling of the activities including a network for the preliminary arrangements for mobilization of resources e.g. manpower, plants and machineries will be done by the Contractor, so as to complete the work within stipulated time.

(b) On completion of the time schedule a firm calendar date schedule will be prepared and submitted by the contractor to the OC Contract who will approve if after due scrutiny. The schedule will be submitted in quadruplicate within six weeks from the date of handing over the site.

SPECIAL CONDITIONS (CONTD)

(c) During the currency of work, the Contractor is expected to adhere to the time schedule and this adherence will be a part of the contractor's performance under the contract. During the execution of the work, the Contractor is expected to participate in the review and updating the network undertaken by OC Contract. These reviews may be undertaken at the discretion of the OC Contract either as periodical appraisal measure or when the quantum of work ordered on the Contractor is substantially changed through deviation order or amendments. Any revision of the schedule as a result of the review will be submitted by the Contractor to the OC Contract within a week who will approve it after due scrutiny. The Contractor will adhere to the revised schedule thereafter. In case of the contractor's not agreeing to the revised schedule the same will be referred to the Accepting Officer whose decision will be final, conclusive and binding. OC's approval to the revised schedule resulting in a completion date beyond the stipulated date(s) of completion shall not automatically amount to grant of extension of time. Extension of time shall be considered and decided by the appropriate authority mentioned in condition 11 of General Conditions of Contracts and separately regulated.

(d) The Contractor is expected to mobilize and employ sufficient resources to achieve the detailed time schedule within the broad framework of the accepted methods of working and safety.

(e) No additional payment will be made to the contractor for any multiple shift work or other incentive methods contemplated by him in his work schedule even though the time schedule is approved by the department.

21. PERMIT FROM LOCAL AUTHORITIES FOR PLYING VEHICLES

Contractor shall make his own arrangements for obtaining necessary permit from local authorities for plying his equipments for the work in accordance with the rules and regulations of the land.

22. ELECTRICITY AND WATER SUPPLY

No electricity or water will be supplied by the department. The contractor shall make his own arrangement for execution of the work.

23. RATE QUOTED

(a) Unit rate shall be deemed to include the provisions for all materials, stores, labour, process, operations and requirements detailed in particular specifications irrespective of whether these appear as specific items or not in the Schedule A.

(b) Unit rates quoted shall also deemed to include all charges/expenses on account of all Veh/Eqpts required for completing the work as specified in Schedule A, Sales Tax, Service Tax, labour welfare cess, Royalty, Work Contract Tax, Octroi, inter state barrier charges, stacking of material or any other charges which are required for completion of work as per Schedule A /Work Order.

(c) The rate quoted shall also include transportation of equipments upto work site including loading/unloading.

EE(C)
SW
For Accepting Officer

(Signature of the Contractor)

SPECIAL CONDITIONS CONTD

24. APPOINTMENT OF ARBITRATOR IN CASE OF CONTRACT AGREEMENTS TO BE EXECUTED BETWEEN BRO AND GOVT OF INDIA UNDERTAKINGS/ ENTERPRISES.

In the event of any dispute or difference between the parties hereto, such dispute of difference shall be resolved amicably by mutual consultation or through the good offices of empowered agencies of the Government. In the event of any such dispute or differences relating to the interpretation and application of the provisions of contracts where such resolution is not possible then the unresolved dispute or differences shall be referred by either party to the Arbitration of one of the Arbitrators in the department of Public Enterprises to be nominated by the Secretary to the Government of India In charge of the Bureau of Public Enterprises, and in such case the **Arbitration and Conciliation Act** shall not be applicable to the arbitration under this clause. The award of the Arbitrator shall be binding upon both the parties in the dispute. Provided, however, any party, aggrieved by such award, may make a further reference for setting aside or revision of the award to the law Secretary, Department of Legal Affairs, Ministry of Law & Justice, Govt. of India. Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary/Additional Secretary when so authorized by the Law Secretary, whose decision shall bind the parties finally and conclusively. The parties to the dispute will share equally the cost of arbitration as intimated by the Arbitrator.

25. MEASUREMENT

Measurements pertaining to the work completed under this contract will be recorded and signed in the measurement book (IAFW-2261) by the Junior Engineer after taking in to account that the required laboratory tests have been done as per the limits stipulated and as per the frequencies laid down in the “Particular Specifications” of this contract agreement and MORTH Specifications for Road and Bridge Works (Latest revision) and connected documents thereof and test results are found satisfactory and proper records are maintained.

(a) The measurement recorded by the Junior Engineer shall be 100% checked and signed by the Engineer-in-Charge.

(b) 25% test check will be carried out by OC Contract on each day of measurement by the Engineer-in-Charge.

(c) 5% test check will be carried out by the Cdr Task Force before making payment to the Contractor.

(d) The measurements should also be signed by the contractor as token of acceptance of the measurement.

(e) In case of discrepancies in arriving out work done details, the decision of the Accepting Officer will be final and binding for both the parties.

26. ACCEPTANCE OF WORK DONE

The Engineer-In-Charge shall exercise control over the quality of materials and work done by carrying out tests for the specified properties as per frequencies given in particular specifications and specifications of MORTH (Ministry of Road Transports and Highways) for Roads And Bridge (latest revision).

27. BLANK

EE (C)
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(Signature of the Contractor) For Accepting Officer

SPECIAL CONDITIONS (CONTD)

28. BLANK

29. RECORD/CONSUMPTION OF MAJOR CONSTRUCTION STORES / MATERIALS

(a) (i) For the purpose of keeping a record of Major Construction Stores like **Cement**, **Bitumen, Bitumen Emulsion, Antistripping Agent, Warm Mix Additives Steel and filler materials** consumed in works, the contractor shall maintain a pucca bound register in the form approved by the Engineer-in-Charge/OC Contract showing daily quantity used in works. The register shall be signed daily by the contractor's representative and the Engineer-in-Charge/OC Contract in token of their verification of its correctness. The check will not, however, absolve the contractor of his responsibility to justify the consumption of bitumen at the time of finalization of his work.

(ii) The register shall be kept at site in the safe custody of the contractor during progress of the work and shall, on demand, be produced for verification of inspecting officers.

(b) (i) The quantity of materials such as paints, water proofing compound and the like as directed by the Engineer-in-Charge (the quantity of which cannot be checked after incorporation in the works), shall be recorded in the register and signed by the contractor and the Engineer-in-Charge as a check to ensure that the required quantity has been brought to site for incorporation in the work.

(ii) Materials brought to site shall be stored as directed by the Engineer-in-Charge in Measurement Book and shall be suitably marked for identification.

(iii) The contractor shall, on demand produce the OC original receipted vouchers in respect of the supplies. Vouchers so produced shall be verified and stamped by Engineer-in-Charge indicating contract number. The contractor shall ensure that the materials are brought to site in original sealed containers/packing, bearing manufacturer's marking except in the case of the requirement of materials(s) being less than smallest packing.

(iv) Contractor shall produce original vouchers from the manufactures and/ or their authorized agents for the full quantity of the following materials, as applicable as a prerequisite before submitting for payment for any advances on account of the work done and/or materials collected in accordance with condition 64 of General Condition of Contracts IAFW-2249.

(a) Cement / Lime.
(b) Steel items.
(c) Bitumen.
(d) Paint
(e) LDO

30. PAYMENT

Payment to the parties will be made in INR in the following manner:-

(a) No advance payment will be made to the contractor against any material if not properly safeguarded against loss / damage due to natural calamities / theft. (Condition 64 of IAFW-2249 shall be deemed amended to this extant).

EE (C)
SW
For Accepting Officer

(Signature of the Contractor)

SPECIAL CONDITIONS (CONTD)

(b) No payment shall be made for any rejected work

(c) Taxes (Income tax, GST, Labour Cess etc) shall be deducted at source from the payment due to contractors as per prevailing laws / statutory orders and TDS certificate shall be issued to the contractor.

(d) All payments will be made by e-payment / account payee cheque.

31. CO-OPERATION WITH OTHER AGENCIES

The contractor shall permit free access and generally afforded reasonable facilities to other agencies or departmentally workmen engaged by the Govt to carry out their part of the work, is any, under separate arrangements.

32. SUPPLY OF COLOUR RECORD PHOTOGRAPHS, ALBUMS AND VIDEO CDs

Contractor shall provide/supply of colour record photographs, Album and video CDs at various stages/facts of the work without any extra cost as per clause 121 of MoRT&H specification for road and bridge works (Fifth Revision).

33. FIELD LABORATORY : To maintain proper quality control at site, contractor shall establish adequately equipped field laboratory without any extra cost. The following minimum testing equipments shall be provided in field laboratory:-

(a) Electrically operated, thermostatically controlled oven range upto 200^0C sensitivity 1^0C.
(b) Balance 20 kg capacity self indicating type.
(c) Water bath-electrically operated and thermostatically controlled with adjustable shelves, sensitivity 1^0C.
(d) Thermometers:-
  (i) Mercury in glass –range upto 250^0C.
  (i) Mercury in Steel –range upto 300^0C with 30 Cm stem
(e) Gas Stove or electric hot plate.
(f) Set of Sieves with lid & pan : 450 mm dia - 63mm to 75 micron.
(g) First aid box.
(h) AIV & Los Angles Abrasion test apparatus.
(j) Flakiness and Elongation test gauges.
(k) Core cutter apparatus 10 cm dia,10/15 cm height, complete with dolly, rammer etc.
(l) Dry bulk density test apparatus complete.
(m) Standard measures of 30,15,3 litres capacity along with tamping rods.
(n) Standard weights.
(o) Centrifuge type bitumen extractor complete with petrol/benzene.
(p) Marshall Stability test apparatus with complete accessories.
(q) Field density bottle along with cutting tray, Chisel, hammer and standard sand.
(r) 3 mtr straight edge.
(s) Camber board.
(t) Core cutting machine with 10 cm dia diamond cutting edge.
(u) Equipment for measuring density of WMM. DBM & AC by sand replacement method.

EE (C)
SW
For Accepting Officer

(Signature of the Contractor)

SPECIAL CONDITIONS (CONTD)

34. TRAFFIC MOVEMENT

Contractor shall ensure that no hindrance to traffic movement shall occure during execution of work. However, if the traffic movement disrupt due to land slide or any other un-foreseen reason, then contractor shall make all efforts to restore traffic movement within time as directed by the OC Contract/Engineer-in-Charge. If contractor is unable or willing to restore traffic movement, Engineer-in-Charge may take action as per condition 8 of IAFW-2249. Contractor shall immediately intimate regarding closure of the road to Engineer-in-Charge and local administrative authorities.

35 VENUE OF ARBITRATION: Place of arbitration hearing shall be as per decision of Arbitrator.

36. DEFECT LIABILITY PERIOD (Refer Condition 46 of IAFW 2249).

Defect Liability period shall be **thirty six calendar months** irrespective of what is specified in Condition 46 of IAFW 2249. Performance Guarantee of 3% of contract sum **(Amended vide GOI Min. of Finance OM No. F.9/4/2020-PPD dated 12 Nov 2020)** as submitted in terms of Condition 19 of IAFW-2249 shall be retained till expiry of defect liability period and shall be refunded to the contractor after the expiration of defect liability period provided always that the contractor shall first have been paid the final bill and have rendered a No-demand certificate (IAFA-451) in terms of condition 68 of IAFW-2249.

37. RE-IMBURSEMENT / REFUND ON VARIATION IN PRICES OF BITUMEN

(This special condition is applicable only in contracts having original completion period more than 18 Months)

Increase or decrease in prices of Bitumen shall be adjusted on the basis stipulated hereinafter irrespective of the actual variation in prices to the contractor:-

$E_B = (Q_B) \times (B_1 - B_O) \times 1.15$

Where:-

E_B = Variation in price of Bitumen to be adjusted . (In Rs.)

Q_B = Quantity of Bitumen , brought at site for incorporation in work / incorporated in work (in MT)

B_O = Ex-refinery price of Bitumen inclusive of all taxes / duties at "refinery nearest to the work site" of Indian Oil Corporation as available on web site of IOC Ltd (i.e. www.iocl.com) as on the last date of receipt of tender. (In Rs/ MT)

B_1 = Ex-refinery price of Bitumen inclusive of all taxes / duties at "refinery nearest to the work site" of Indian Oil Corporation as available on web site of IOC Ltd (i.e. www.iocl.com) as on the date of purchase of bitumen. (In Rs/ MT)

(Factor of 1.15 has been used to cover contractor's overhead and profit)

Notes:-

1. No adjustments, whats over, due to variation in prices of materials and fuel on account of coming into force of any fresh law or statutory rule or order as provided in condition 63 ofIAFW-2249 or otherwise than provided in this condition shall be made. In short once this special condition is operative condition 63 of IAFW-2249 stands superseded.

EE (C)
SW
For Accepting Officer

(Signature of the Contractor)

SPECIAL CONDITIONS (CONTD)

2. No adjustment in prices shall be made for any work done with materials brought at site after the stipulated date of completion given in work order No. 1 or extension of time granted under condition 11 of IAFW-2249 (whichever is later) for the work under the contract.

3. Any dispute arising out of interpretation of application of this special condition shall be referred to the Accepting Officer whose decision shall be final and binding.

4. For purpose of calculation of retention money, liquidated damages, sales tax / service tax on works contracts, deduction of income tax at source and recovery of water charges (in case of unmetered supply) the value of contracts as revised by the above price variation will be taken into account.

38. CONCILIATION

1. Conciliation shall be conducted as laid down u/s 61 to 81 of Arbitration and Conciliation Act 1996 (Part III) unless specified otherwise here-in-after.

1.1.1 The scope of conciliation shall be restricted to the following types of disputes with financial limits as indicated therein:-

(a) Disputes relating to levy of compensation for delay in completion, actual amount of compensation.

(b) Disputes relating to technical examination of works.

(c) Disputes relating to interpretation of the provisions of the contract with reference to their application to parties.

(d) Disputes relating to non return of Schedule 'B' stores over-issued to contractor.

(e) Disputes relating to assessment of loss/damage occurred in executed work only (and not for contractor's material & V/E/P) due to natural calamities.

(f) Any other disputes having fair chances of being resolved by conciliation and considered fit to be conciliation by the parties.

1.2 COMMENCEMENT OF CONCILIATION PROCEEDINGS

1.2.1 The party initiating conciliation shall send to the other party a written invitation to conciliate, briefly identifying the subject of the dispute.

1.2.2 Conciliation proceedings shall commence when the other party accepts in writing the invitation to conciliate.

1.3 Number of Conciliators

1.31 There shall be a sole conciliator.

1.4 Appointment of Conciliator

1.4.1 All disputes brought out in Para 1.1.1 (a) to (f) above shall be referred to the Sole Conciliator viz Serving Officer not below the rank of Superintending Engineer having degree in Engineering or equivalent to be appointed by the concerned ADGBR or in his absence the Officer Officiating as ADGBR specifically delegated by the ADGBR in writing.

EE (C)
SW

(Signature of the Contractor) For Accepting Officer

SPECIAL CONDITIONS (CONTD)

1.5 STATUS OF EFFECT OF SETTLEMENT AGREEMENT

1.5.1 The settlement agreement signed by the parties as a result of conciliation proceedings shall have the same status and effect as it is an arbitral award on agreed terms.

39. BLANK

40. ARBITRATION (REFER CLAUSE 70 OF CONDITION OF CONTRACT OF IAFW-2249)

All disputes or differences arising as aforementioned, other than those for which the decision of the Accepting Officer or any other person is by the contract expressed to be final and binding shall be referred to sole arbitrator under condition No 70 of General Conditions of contract IAFW-2249 after written notice by either party of the contract to the other of them. In addition to above Arbitration and conciliation (Amendment) Act 2015 will also prevail.

41. LEGAL JURISDICTION: Legal jurisdiction for this contract agreement shall be **"Courts at Siliguri/Kolkata in the State of West Bengal"**.

42. **HIRING CHARGES OF LAND:** Payment of rent for road side land if any where crusher and HMP plants will be installed based on the requirement of Daily works will be payable by Contractor and this will not be reimbursable by the Deptt.

43. CONTRACT LABOUR (R&A) ACT 1970

The contractor shall get himself registered with Asst Labour Commisiioner, Siliguri as required under contract labour (Regulation and Abolition) Act 1970. If he does not fall within the purview of said act, he shall obtain a no objection certificate from ALC, Jalpaiguri to above effect. A copy of the certificate of registration or the no objection certificate (as the case may be) shall be submitted by him to the Accepting Officer within 15 days of the award of the work. In the event of his non-compliance, the contractor shall be liable for punitive action under CL (R&A) Act 1970.

44. LOSS OR DAMAGE ON ACCOUNT OF ENEMY ACTION

(a) If as a result of enemy action, the contractor suffers any loss or damage, the Government shall reimburse to the contractor such loss or damages, to the extend and in the manner herein after provided:-

(i) The loss suffered by him on account of any damage or distruction of his equipment (as defined in condition 11 (2) above), the amount of losses assessed by the Accepting Officer of the contract on this account shall be final and binding.

(ii) Compensation paid by him under any law for the time being in force to any workmen employed by him for any injury caused to him or the workmen's legal successor for loss of the workmen's life.

(b) No requirement shal be made nor shall any compensation be payable under the above provisions unless the contractor had taken Air Defence Precautions ordered in writing by OC concerned or in the absence of such orders, reasonable precautions. No re-imbursement shall be made nor shall any compensation be payable for any equipments not laying on the site of work at the time of enemy action.

EE (C)
SW
For Accepting Officer

(Signature of the Contractor)

SPECIAL CONDITIONS (CONTD)

45. REGISTRATION FEE/TRADE TAX/INCOME TAX ETC.

Tendered rates/amount shall also be deemed to include the payment of all taxes like Registration fee, Trade Tax, Income Tax and other taxes/levies to be paid to the Govt of India/Royal Govt of Bhutan already in force and as may be modified from time to time. The contractor may ascertain full details on this respect from the concerned department(s).

46. ADJUSTMENT OF TAX CONSEQUENT UPON AMENDMENT TO CONSTITUTION

The tendered rate shall also be inclusive of all statute levies and State / Union Territory / shall tax on works contract payable under the respective statutes pursuant to the constitution stipulated by the tenderers regarding sales tax on works contracts will not be considered and such tender will be liable for reject

47. ESCALATION:- No claim of reimbursement in increase of labour wages, cost of POL and materials is admissible under this contract including extended period, if any.

48. INCOME TAX:- Indian Income Tax @ 2% and BCT (@ 3% for Indian Contractors and @ 2% for Bhutanee Contractors) will be deducted at source as applicable.

49. DEDUCTION OF TAX AT SOURCE:- Indian Income tax and BCT shall be deducted at source as applicable

50. REGISTRATION:- Contractor is required to get his firm registered with GST and Asst Labour Commissioner of the area under Contract Labour (R&A) Act and Building and other construction workers Act. A Copy of valid registration certificate issued will be submitted to OC Contract while processing RARs / Bills.

51. MANDATORY REQUIREMENT FOR MAKING PAYMENTS: E-PAYMENT THROUGH NEFT/RTGS/ECS/EBS (THIS SUPERSEDES CONDITION 66 OF GENERAL CONDITIONS OF CONTRACT OF IAFW-2249.

51.1 All payment will be made through E-payment and hence tenderers must furnish NEFT Form duly signed by the Bank Authorities.

Appendix-A to special conditions No 45

NEFT / RTGS MANDATE FORM

1.	Name of Firm / contractor as per account in the Bank	
2.	Beneficiary's Account Number (As appearing on the Cheque Book)	
3.	Name of Bank where a/c is held	
4.	Name of Branch	
5.	Address of Branch	
6.	Telephone No. of Branch	
7.	IFSC Code of Branch	
8.	9-digit MICR Code Number of the Bank & Branch	
9.	E-mail ID of Contractor	

EE (C)
SW
For Accepting Officer

(Signature of the Contractor)

SPECIAL CONDITIONS (CONTD)

Annexure-I to special conditions

FORMAT FOR BANK GURANTEE FOR ADVANCE PAYMENT

From:
Bank_____
To
The President of India
Sir,

1. With reference to contract Agreement No_____ concluded between the president of India, hereinafter referred to as "The Government" and M/S_____ hereinafter referred to as the "the contractor" for _____ as detailed in the above contract agreement hereinafter referred to as "the said contract" and in consideration of the Government having agreed to make an advance payment in accordance with the terms of the said contract to the said contractor, we the _____bank, hereinafter call 'the Bank' hereby irrevocably undertake and guarantee to you that if the said contractor would fail to provide works in accordance with the terms & conditions of the said contract for any reason whatsoever or fail to perform the said contract in any respect or should whole or part of the said on account payments at any time become repayable to you for any reason whatsoever, we shall, on demand and without demur pay to you all and any sum up to a maximum of Rs._____(Rupees _____only) paid as advance to the Contractor in accordance with the provisions contained in clause_____ of the said contract.

2. We further agree that the Government shall be the sole judge as to whether the contract has failed to provide works in accordance with the terms & conditions of the said contract or has failed to perform the said contract in any respect or the whole or part of the advance payment made to contractor has become repayable to the Government and to the extent and monetary consequences thereof by the Government.

3 We further hereby undertake to pay the amount due and payable under this Guarantee without any demur merely on a demand from the Government stating the amount claimed. Any such demand made on the Bank shall be conclusive and binding upon us as regards the amounts due and payable by us under this Guarantee and without demur, However, our liability under this Guarantee shall be restricted to an amount not exceeding Rs_____ Rupees _____ only).

4. We further agree that the Guarantee herein contained shall remain in full force and effect for a period upto_____(03 months+due date of recovery of advance) unless the Government in his sole discretion discharges the Guarantee earlier.

5. We further agree that any change in the constitution of the Bank or the constitution of the contractor shall not discharge our liability hereunder

6. We further agree that the Government shall have that fullest liberty without affecting in any way our obligations hereunder with or without our consent or knowledge to vary any of the terms and conditions of the said contract or extend the time of development/delivery from time to time or to post pone for any time or from time to time any of the powers exercisable by the Government against the contractor and either to forebear or enforce any of the terms and conditions relating to the said contract and we shall not be relieved from our liability by reason of any such variation or any indulgence or for bearance shown or any act omission on the Government or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have the effect of so relieving us.

7. We lastly undertake not to revoke the Guarantee during the currency of the above said contract except with the prior consent of the Government in writing.

Yours faithfully,

Place: _____

For_____ Bank
(Authorised Attorney)

Date : _____

Seal of Bank

EE (C)
SW
For Accepting Officer

(Signature of the Contractor)

SPECIAL CONDITIONS (CONTD)

Note:- **Please attach a blank cancelled cheque for verification of the above particulars.**

I, hereby, declare that the particulars given above are correct and complete. If the transaction is delayed or not effected due to incomplete or incorrect information of the bank details, I will not hold the payment releasing authority responsible for it.

Dated: Signature of the Contractor (Seal)

CERTIFICATE BY BANK

Certified that the particulars furnished above are correct as per our records.

Seal of Bank (Signature of the branch manager of the Bank)
Dated :

Annexure-II to special conditions

FORMAT FOR BID SECURING DECLARATION
(To be enclosed with tender documents)

1. I hereby submit a declaration that the bid submitted by the undersigned, on behalf of the bidder, M/S_____, either sole of in JV, shall not withdrawn or modified during the period of validity.

2. I, on behalf of the bidder, M/S _____ , also accept the fact that in case the bid is withdrawn or modified during the period of its validity or if we fail to sign the contract in case of work is awarded to us or we fail to submit a performance security before the deadline defined in the tender document then, M/S_____, will be suspended for participation in the tendering process for the works of BRO/MoRT&H/NHAI/NHIDCL/Any other Govt. Deptt. and work under other centrally sponsored schemes, for a period of one year from the bid due date of this work.

(Signature of the Authorised signatory)
(Official Seal)

EE (C)
SW
(Signature of the Contractor) For Accepting Officer

PARTICULAR SPECIFICATIONS

CONSTRUCTION OF 20 NOS OF 2 MTR SPAN RCC CULVERTS IN CONVENTIONAL METHOD AND PROVIDING AND LAYING OF WMM 100 MM AND 75 MM COMPACTED THICKNESS, DBM 60 MM COMPACTED THICKNESS AND BC 40 MM COMPACTED THICKNESS INCLUDING APPLICATION OF PRIME COAT, TACK COAT, ROLLING AND COMPACTION AS PER MORT&H SPECIFICATIONS AND ROAD MARKING WITH THERMOPLASTIC PAINT 2.50 MM THICK CONFORMING TO MOST 803.4 INCLUDING PREPARATION OF SURFACE FOR CARRYING OUT SURFACING WORKS BETWEEN KM 48.000 TO KM 53.000 ON CONFLUENCE - HAA ROAD UNDER 19 BRTF OF PROJECT DANTAK INSIDE BHUTAN.

SCOPE OF WORK : The scope of work shall consist of Permanent works and Surfacing works. All materials to be used, all methods adopted and all works performed shall be strictly in accordance with the requirements of the specifications mentioned herein.

GENERAL

The specifications contained in Ministry of Road Transport and Highways "Specifications for Road and Bridge Works (Fifth Revision)" published by Indian Road Congress during Apr 2013 (hereinafter referred to as MoRT&H Specifications) shall generally be followed.

1. PERMANENT WORKS

1.1 EXCAVATION FOR STRUCTURES

1.1.1 Scope

Excavation for structures shall consist of the removal of material for the construction of foundations for culverts, retaining walls, breast walls, headwalls, cutoff walls, culverts and other similar structures, in accordance with the requirements of these specifications and the lines and dimensions shown on the drawings or as indicated by the Engineer-in-Charge/OC Contract. The work shall include the removal of all logs, stumps, grubs and other deleterious matter and obstructions, necessary for placing the foundations; trimming bottoms of excavations; backfilling and clearing up the site and the disposal of all surplus material.

EE (C)
SW
For Accepting Officer

(Signature of the Contractor)

PARTICULAR SPECIFICATIONS (CONTD)

1.1.2 Classification of Excavation

All materials involved in excavation shall be classified in accordance with Clause 301.2. of MoRT&H Specifications for Road and Bridge Works (Fifth Revision) .

1.1.3 Construction Operations

Setting out: After the site has been cleared according to Clause 201 of MoRT&H Specifications for Road and Bridge Works (Fifth Revision), the limits of excavation shall be set out true to lines, curves and slopes to Clause 301.3.1.of MoRT&H Specifications for Road and Bridge Works (Fifth Revision).

1.1.4 Excavation

1.1.4.1 Excavation shall be taken to the width of the lowest step of the footing including additional width as required for construction operation. The sides shall be left plumb where the nature of soil allows it. Where the nature of soil or the depth of the trench and season of the year do not permit vertical sides, the Contractor at his own cost shall put up necessary shoring, strutting and planking or cut slopes to a safer angle or both with due regard to the safety of personnel and works and to the satisfaction of the Engineer-in-Charge/OC Contract.

1.1.4.2 The depth to which the excavation is to be carried out shall be as shown on the drawings, unless the type of material encountered is such as to require changes, in which case the depth shall be as ordered by the Engineer-in-Charge/OC Contract. Propping shall be undertaken when any foundation or stressed zone from an adjoining structure is within a line of 1 vertical to 2 horizontal from the bottom of the excavation.

1.1.4.3 Where blasting is to be resorted to, the same shall be carried out in accordance with Clause 302 of MoRT&H Specifications for Road and Bridge Works (Fifth Revision) and all precautions indicated therein observed. Where blasting is likely to endanger adjoining foundations or other structures, necessary precautions such as controlled blasting, providing rubber mat cover to prevent flying of debris etc. shall be taken to prevent any damage.

1.1.5 Dewatering and protection

1.1.5.1 Normally, open foundations shall be laid dry. Where water is met with in excavation due to stream flow, seepage, springs, rain or other reasons, the Contractor shall take adequate measures such as bailing, pumping, constructing diversion channels, drainage channels, bunds, depression of water level by well-point system and other necessary works to keep the foundation trenches dry when so required and to protect the green concrete/masonry against damage by erosion or sudden rising of water level. The methods to be adopted in this regard and other details thereof shall be left to the choice of the Contractor but subject to approval of the Engineer-in-Charge/OC Contract. Approval of the Engineer-in-Charge/OC Contract shall, however, not relieve the Contractor of the responsibility for the adequacy of dewatering and protection arrangements and for the quality and safety of the works.

EE (C)
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PARTICULAR SPECIFICATIONS (CONTD)

1.1.5.2 If it is determined beforehand that the foundations cannot be laid dry or the situation is found that the percolation is too heavy for keeping the foundation dry, the foundation concrete shall be laid under water by tremie pipe only. In case of flowing water or artesian springs, the flow shall be stopped or reduced as far as possible at the time of placing the concrete.

1.1.5.3 Pumping from the interior of any foundation enclosure shall be done in such a manner as to preclude the possibility of the movement of water through any fresh concrete. No pumping shall be permitted during the placing of concrete or for any period of at least 24 hours thereafter, unless it is done from a suitable sump separated from the concrete work by a watertight wall or other similar means.

1.1.5.4 At the discretion of the Contractor, cement grouting or other approved methods may be used to prevent or reduce seepage and to protect the excavation area.

1.1.5.5 The Contractor shall take all precautions in diverting channels and in discharging the drained water as not to cause damage to the works, crops or any other property.

1.1.6 Preparation of foundation

1.1.6.1 The bottom of the foundation shall be leveled both longitudinally and transversely or stepped as directed by the Engineer-in-Charge/OC Contract. Before footing is laid, the surface shall be slightly watered and rammed. In the event of excavation having been made deeper than that shown on the drawings or as otherwise ordered by the Engineer-in-Charge/OC Contract, the extra depth shall be made up with concrete as per Clause 2104.1 of MoRT&H Specifications for Road and Bridge works (Fifth Revision). Ordinary filling shall not be permitted to bring the foundation to the design level as shown in the drawing.

1.1.6.2 When rock or other hard strata is encountered, it shall be freed of all soft and loose material, cleaned and cut to a firm surface either level and stepped as directed by the Engineer-in-Charge/OC Contract. All seams shall be cleaned out and filled with cement mortar or grout to the satisfaction of the Engineer-in-Charge/OC Contract. In the case of excavation in rock, annular space around footing shall be filled with lean concrete M 15 upto the top level of rock.

1.1.6.3 If the depth of fill required is more than 1.5m in soft rock or 0.60 m in hard rock above the foundation level, the filling upto this level shall be done with M 15 concrete and portion above shall be filled by concrete or by boulders grouted with cement.

1.1.7 Slips and slip-outs: If there are any slips or slip-outs in the excavation, these shall be removed by the Contractor at his own cost.

1.1.8 Public Safety: Near towns, villages and all frequented places, trenches and foundation pits shall be securely fenced, provided with proper caution signs and marked with red lights at night to avoid accidents. The Contractor shall take adequate protective measures to see that the excavation operations do not affect or damage adjoining structures. For safety precautions, guidance may be taken from IS: 3764.

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PARTICULAR SPECIFICATIONS (CONTD)

1.1.9 Back filling: Backfilling shall be done with approved material after concrete or masonry is fully set and carried out in such a way as not to cause undue thrust on any part of the structure. All space between foundation masonry or concrete and the sides of excavation shall be refilled to the original surface in layers not exceeding 150 mm compacted thickness. The compaction shall be done with the help of suitable equipment such as trench compactor, mechanical tamper, rammer, plate vibrator etc., after necessary watering, so as to achieve the maximum dry density.

1.1.10 Disposal of surplus excavated materials: All the excavated material is the property of the Employer. The material obtained from the excavation of roadway, verges, drains, cross drainage work etc shall be used for filling up of (i) roadway embankment , (ii) the existing pit in the right of way and (iii) for landscaping of the road as directed by the Engineer-in-Charge/OC Contract, including leveling and spreading with all lift and lead as directed by Engineer-in-Charge/OC Contract.

1.1.11 Measurements for Payment : Excavation for structures shall be measured in Cum for each class of material encountered, limited to the dimensions shown on the drawings or as directed by the Engineer-in-Charge/OC Contract. Excavation over increased width, cutting of slopes, production/support to the existing structures, shoring, shuttering and planking shall be deemed as incidental to the main work and shall not be measured and paid for separately.

1.1.12 Rate

1.1.12.1 Blank

1.1.12.2 If the concrete structure is found to be acceptable by the Engineer-in-Charge/OC Contract as sub-standard work, the Contractor shall be subjected to reduction in his contrsct unit rate. For deficiency in compressive strength of concrete when accepted by the Engineer-in-Charge/OC Contract, the reduction in rate may be applied as under:

$$\text{Percentage reduction in rate} = \frac{\text{Design Strength} - \text{Observed Strength}}{\text{Design Strength}} \times 100$$

1.1.12.3 The Contract unit rate for structures shall be payment in full for carrying out the required operations including full compensation for :

(i) Setting out;

(ii) transporting the excavated materials for use or disposal with all leads and lifts;

(iii) Construction of necessary sheeting, shoring and bracing and their subsequent removal;

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PARTICULAR SPECIFICATIONS (CONTD)

(iv) Removal of all logs, stumps, grubs and other deleterious matter and obstructions, for placing the foundations including trimming of bottoms of excavations;

(v) Foundation sealing, dewatering including pumping when no separate provision for it is made in the Contract;

(v) Backfilling, clearing up the site and disposal off all surplus material within all leads and lifts or as otherwise specified; and

(vi) All labour, materials, tools, equipment, safety measures, diversion of traffic and incidentals necessary to complete the work to Specifications.

1.1.12.4 The Contract unit rate for preparation of rock foundation shall be full compensation for cutting, trimming and cleaning the foundation surface and filling/sealing of all seams with cement grout or mortar including all materials, labour and incidentals required for completing the work.

1.2 STRUCTURAL CONCRETE (Rate shall be measured in Cum)

1.2.1 Description

The work shall consist of producing, transporting, placing and compacting of structural concrete including fixing formwork and temporary works etc and incidental construction in accordance with these specifications and in conformity with the lines, grades and dimensions,as shown on the drawings or as directed by the Engineer-in-Charge/OC Contract.

1.2.2 Materials

All materials shall conform to Section 1000 of MoRT&H specifications for road and bridge works (Fifth Revision).

1.2.3 Grades of Concrete

The grades of concrete shall be designated by the characteristic strength as given in Table 1700-1 of MoRT&H specifications for Road and Bridge Works (Fifth Revision), where the characteristic strength is defined as the strength of concrete below which not more that 5 per cent of the test results are expected to fall.

Grade designation	Specified characteristic Compressive strength of 150 mm cubes at 28 days, in MPa
M 15	15
M 20	20
M 25	25
M 30	30
M 35	35
M 40	40
M 45	45
M 50	50
M 55	55

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For Accepting Officer

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PARTICULAR SPECIFICATIONS (CONTD)

1.2.4 Proportioning of Concrete

Prior to the start of construction, the Contractor shall design the mix in case of "Design Mix Concrete" or propose nominal mix in case of "Nominal Mix Concrete", and submit to Engineer-in-Charge/OC Contract for approval, the proportions of materials, including admixtures to be used. Water-reducing admixtures (including plasticizers or super-plasticizers) may be used at the Contractor's option, subject to the approval of the Engineer-in-Charge/OC Contract.

1.2.5 Mixing Concrete

i) All concrete shall be machine mixed. In order to ensure uniformity and good quality of concrete, the ingredients shall be mixed in a power driven batch mixer with hopper and suitable weigh batching arrangement or in a central mix plant. Hand mixing shall not be permitted. The mixer or the plant shall be at an approved location considering the properties of the mixes and the transportation arrangements available with the Contractor. The mixer or the plant shall be approved by the Engineer-in-Charge/OC Contract.

ii) Mixing shall be continued till materials are uniformly distributed, a uniform colour of the entire mass is obtained and each individual particle of the coarse aggregate shows complete coating of mortar containing its proportionate amount of cement. In no case shall mixing be done for less than 2 minutes. It shall be ensured that the mixers are not loaded above their rated capacities and are operated at a speed recommended by the manufacturer. When mineral admixtures are added at the mixing stage, their thorough and uniform blending with cement shall be ensured, if necessary by longer mixing time. The addition of water sfter the completion of the linitial mixing operation, shall not be permitted.

iii) Mixers which have been out use for more than 30 minutes shall be thoroughly cleaned before putting in a new batch and also before changing from one type of cement to another..

1.2.6 Transporting, Placing And Compaction Of Concrete

i) Mixed concrete shall be transported from the place of mixing to the place of final deposit as rapidly as possible by methods which will prevent the segregation or loss of the ingredients. The method of transporting or placing of concrete shall be approved by the Engineer-in-Charge/OC Contract. Concrete shall be transported and placed as near as practicable to its fina position so that no contamination, segregation or loss of its constituents materials take place.

ii) Concrete may be transported by transit mixers or properly designed buckets or by pumping. Transit mixers or other hauling equipments when used should be equipped with the means of dischargeof concrete without segregation. During hot or cold weather, concrete shall be transported in deep containers. Other suitable methods to be reduce the loss of water by evaporation in hot weather and heat loss in cold weather may also be adopted.

PARTICULAR SPECIFICATIONS (CONTD)

iii) 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 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.

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

v) No concrete shall be placed in any part of the structure until the approval of the Engineer-in-Charge/OC Contract has been obtained. 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/OC Contract. Concreting shall proceed continuously over the area between the 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.

vi) The concrete shall be deposited as nearly as practicable in its original position to avoid re-handling. Methods of placing should be such as to preclude segregation. Care should be taken to avoid displacement of reinforcement or movement of formwork. To achieve this, concrete should be lowered vertically in the form and horizontal movement of concrete inside the forms should, as far as practicable, be minimized.

vii) The concrete shall be placed and compacted before its initial setting so that is is amenable to compaction by vibration. The workability of concrete at the time of placement shall be adequate for the compaction equipment to be used. If there is considerable time gap between mixing and placing of concrete, as in the case of ready mixed concrete plants or off-site batching and mixing plants, concrete mix shall be designed to have appropriately higher workability at the time of discharge from the mixer, in order to compensate the loss of workability during transit. This is generally achieved by suitable chemical admixtures. Keeping this considerations in view, the general requirements for ready mixed concrete plants or off-site batching and mixing plants, is that concrete shall be discharged from the truck mixer within two hours of the time of loading. A longer period may be permitted if suitable retarding admixture are used.

iii) In wall forms, drop chutes attached to hoppers at the top should preferable be used to lower concrete to the bottom of the form. As a general guidance, the permissible free fall of concrete may not exceed 1.50 meters and under no circumstances shall it be more than 2 meters. When free fall of larger height is involved, self compacting concrete having adequate fluidity, cohesiveness and viscosity and which uniformly and completely fills every corner of the formwork by its own weight without segregation, shall be used.

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PARTICULAR SPECIFICATIONS (CONTD)

ix) Except where otherwise agreed to by the Engineer-in-Charge/OC Contract, concrete shall be deposited in horizontal layers to a compacted depth of not more than 450 mm when internal vibratos are used and not exceeding 300 mm in all other cases.

x) Concrete when deposited shall have a temperature of not less than 5°C, and preferably not more than 30°C and in no case more than 40°C. In case of site mixing, fresh concrete shall be placed and compacted in its final position within 30 minutes of its discharge from the mixer. When the concrete is carried in properly designed agitator operating continuously, the concrete shall be placed and compacted within 1 hour of the addition of cement to the mix and within 30 minutes of its discharge from the agitator. It may be necessary to add retarding admixtures to concrete if trials show that the periods indicated above are unacceptable. In all such matters, the Engineer-in-Charge/OC Contract's decision shall be final.

xi) Concrete shall be thoroughly compacted by vibration or other means during placing and worked around the reinforcement, tendons or duct formers, embedded fixtures and into corners of the formwork to produce a dense homogeneous void-free mass having the required surface finish. When vibrators are used, vibration shall be done continuously during the placing of each batch of concrete until the expulsion of air has practically ceased in a manner that does not promote segregation. Over vibration shall be avoided to minimize the risk of forming a weak surface layer. When external vibrators are used, the design of formwork and disposition of vibrator shall be such as to ensure efficient compaction and to avoid surface blemishes. Vibrations shall not be applied though reinforcement and where vibrators of immersion type are used, contact with reinforcement and all inserts like ducts etc., shall be avoided. When internal vibrators are used, the internal vibrators shall be inserted vertically to the full depth of the layer being placed and ordinarily shall penetrate the layer below fr a few centimeters. The vibrator should be kept in place until air bubbles cease escaping from the surface and then withdrawn slowly to ensure that no hle is left in the concrete, care being taken to see that it remains in continued operation while being withdrawn. The internal vibrators shall be inserted in an orderly manner and the distance between insertions should be about one and half times the radius of the area visibly affected by vibration. Additional vibrators in serviceable conition shall be kept at site so that they can be used in the event of breakdown.

xi) Mechanical vibrators used shall comply with IS: 2502, IS: 2506, IS: 2514 and IS: 4656.

1.2.7 Construction Joints

i) Construction joints shall be avoided as far as possible and in no case the locations of such joints shall be changed or increased from those shown on the drawings, except with express approval of the Engineer-in-Charge/OC Contract.

ii) The sequence of concreting, striking of forms and positioning of construction joints for every individual structrure, shall be decided well in advance of the commencement of work.

PARTICULAR SPECIFICATIONS (CONTD)

iii) Construction joints has to be provided in accordance with Clause 1709 of MoRT&H Specifications for Road & Bridge Works (Fifth Revision).

1.2.8 Concreting Under Water

i) When it is necessary to deposit concrete under water, the methods, equipment, materials and proportions of mix to be used shall be got approved from the Engineer-in-Charge/OC Contract before any work is started.

ii) Concrete shall not be placed in water having a temperature below 5°C. The temperature of the concrete, when deposited, shall not be less than 16°C nor more than 30°C.

iii) The under water concreting shall be done in accordance with Clause 1710 of MoRT&H Specifications for Road & Bridge Works (Fifth Revision).

1.2.9 Concreting in Extreme Weather

Concreting in Cold Weather : Where concrete is to be deposited at or near freezing temperature, precautions shall be taken to ensure that at the time of placing, it has a temperature of not less than 5°C and that the temperature of the concrete shall be maintained above 4°C until it has hardened. When necessary, concrete ingredients shall be heated before mixing but cement shall not be heated artificially other than by the heat transmitted to it from other ingredients of the concrete. Stock-piled aggregate may be heated by the use of dry heat or steam. Aggregates shall not be heated directly by gas or on sheet metal over fire. In general, the temperature of aggregates or water shall not exceed 65°C. Salt or other chemicals shall not be used for the prevention of freezing. No frozen material or materials containing ice shall be used. All concrete damaged by frost shall be removed. Concrete exposed to freezing weather shall have entrained air and the water content of the mix shall not exceed 30 litres per 50 kg of cement. To counter slower setting of concrete, accelerators can be used with the approval of the Engineer-in-Charge/OC Contract. However, accelerators containing chloride shall not be used.

1.2.10 Concreting in Hot Weather

i) When depositing concrete in very hot weather, precautions shall be taken so that the temperature of wet concrete does not exceed 30°C while placing. This shall be achieved by using chilled mixing water, using crushed ice as a part of mixing water, shading stock piles of aggregates from direct rays of sun, sprinkling the stock piles of coarse aggregate with water to keep them moist, limiting temperature of cement below 30°C at the time of use, starting curing before concrete dries out and restricting time of concreting as far as possible to early mornings and the late evenings. When ice is used to cool mixing water, it will be considered a part of the water in design mix. Under no circumstances shall the mixing operation be considered complete until all ice in the mixing drum has melted.

ii) The Contractor will be required to state his methodology for the Engineer-in-Charge/OC Contract's approval when temperatures of concrete are likely to exceed 30°C during the work.

EE (C)
SW
For Accepting Officer

(Signature of the Contractor)

PARTICULAR SPECIFICATIONS (CONTD)

1.2.11 Protection And Curing

Concreting operations shall not commence until adequate arrangements for concrete curing have been made by the Contractor. Curing and protection of concrete shall start immediately after compaction of the concrete. The concrete shall be protected from:

(a) Premature drying out particularly by solar radiation and wind

(b) High internal thermal gradients

(c) Leaching out by rain and flowing water

(d) Rapid cooling during the first few days after placing

(e) Low temperature or frost

(f) Vibration and impact which may disrupt the concrete and interfere with its bond to the reinforcement

(g) Vibration caused by traffic including construction traffic.

Concrete shall be protected, without allowing ingress of external water, by means of wet (not dripping) gunny bags, hessian etc. Once the concrete has attained some degree of hardening (approximate 12 hrs after mixing), moist curing shall commence and be continued through the requisite period. Where members are of considerable size and length, with high cement content, accelerated curing methods may be applied, as approved by the Engineer-in-Charge/OC Contract.

1.2.12 Water Curing

i) Water for curing shall be as specified in Section 1000 of MoRT&H Specifications for Road & Bridge Works (Fifth Revision)

ii) The concrete should be kept constantly wet by ponding or covering or use of sprinklers/perfrated pipes for a minimumperiod of 14 days after concreting, except in the case of concrete with rapid hardening cement, where it can be reduced to 5 days. Water should be applied on surfaces after the final set. Curing through watering shal not be done on green concrete. On formed surfaces, curing shall start immediately after the forms are stripped. The concrete shall be kept constantly wet with a layer of sacking, canvas, hessian or similar absorbent material.

1.2.13 Finishing

i) Immediately after the removal of forms, exposed bars or bolts, if any, shall be cut inside the concrete member to a depth of at least 50 mm below the surface of the concrete and the resulting holes filled with cement mortar. All fins caused 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. The mortar shall be 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. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surfaces which have been pointed shall be kept moist for a period of twenty four hours. Special pre-packaged proprietary mortars shall be used where appropriate or where specified in the drawing.

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PARTICULAR SPECIFICATIONS (CONTD)

ii) 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 exposed for its full length with clean and true edges.

iii) Immediately on removal of forms, the concrete work shall be examined by the Engineer-in-Charge/OC Contract before any defects are made good. The work that has sagged or contains honeycombing to an extent detrimental to structural safety or architectural appearance member, shall be rejected. Surface defects of a minor nature may be accepted. On acceptance of such work by the Engineer-in-Charge/OC Contract, the same shall be rectified as directed by the Engineer-in-Charge/OC Contract.

1.2.14 Tests And Standards Of Acceptance

1.2.14.1 Concrete shall conform to the surface finish and tolerance as prescribed in MoRT&H Specifications for Road & Bridge Works (Fifth Revision) for respective components.

Random sampling and lot by lot of acceptance inspection, shall be made for the 28 days cube strength of concrete.

Concrete under acceptance, shall be notionally divided into lots for the purpose of sampling before commencement of work. The basis of delimitation of lots shall be as follows :

(a) No individual lot shall be more than 30 Cum volume

(b) Different grades of mixes of concrete shall be divided into separate lots

(d) Concrete of a lot shall be used in the same identifiable components of the bridge/structure.

1.2.14.2 Sampling and testing

a) Concrete for preparing 3 test cubes shall be taken from a batch of concrete at point of delivery into construction, according to procedure laid down in IS: 1199.

b) A random sampling procedure to ensure that each of the concrete batches forming the lot under acceptance inspection has equal chance of being chosen for taking cubes.

c) 150 mm cubes shall be made, cured and tested at the age of 28 days for compressive strength in accordance with IS:516. The 28-days test strength result for each cube shall form an item of the sample. Tests at other age shall also be performed, if specified.

d) Where automated batching plant/Ready Mixed Concrete Plnt is located away from the place of use and the time gap between production and placement is more than the initial setting time or where any ingredients are added subsequent to mixing, separate sets of samples shall be collected and tested at batching plantand at location of placement. The results shall be compared and used to make suitable adjustment at batching plants so that properties of concrete at placement are as per the requirements.

EE (C)
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For Accepting Officer

(Signature of the Contractor)

PARTICULAR SPECIFICATIONS (CONTD)

1.2.14.3 Test specimen and sample strength

Three test specimens shall be made from each sample for testing at 28 days. Additional cubes may be required for various purposes such as to determine the strength of concrete at 7 days or for any other purpose.

The test strength of the sample shall be the average of the strength of 3 cubes. The individual variation should not be more than ± 15 % of the average. If variation is more, the test results of the sample are invald.

1.2.14.4 Frequency : The minimum frequency of sampling of concrete of each grade shall be in accordance with Table 1700-9 of MoRT&H Specifications for Road & Bridge Works (Fifth Revision) below:-

Quantity of Concrete in work, m^3	No. of samples
1 – 5	1
6 – 15	2
16 – 30	3
31 – 50	4
51 and above	4 Plus one additional sample for each additional 50 m^3 part thereof

At least one sample shall be taken from each shift of work.

1.2.14.5 Acceptance Criteria

(a) **Compressive Strength**

1) **Cubes** : The concrete shall be taken as having the specified compressive strength when both the following conditions are met:

a) The mean strength determined from any group of four consecutive on-verlaping smples exceeds the specified characteristic compressive strength by 3 MPa.

b) Strength of any sample is not less than the specified characteristic compressive strength minus 3 MPa.

The quantity of concrete represented by the test results include the batches from which the first and last samples were taken, together with all intervening batches.

2) **Cores:**

When the concrete does not satisfy both the conditions given in (1) above, representative cores shall be extracted from the hardened concrete for compression test in accordance with the method described in IS:1199 and tested to establish whether the concrete satisfies the requirement of compressive strength.

Evaluation of compressive strength by taking cores may also be done in case of doubt regarding the grade of concrete used either due to poor workmanship or based on results of cubs strength test.

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PARTICULAR SPECIFICATIONS (CONTD)

The locations from which core samples are to be taken and their number shall be decided so as to be representative of the whole of the concrete under consideration. However, in no case shall fewer than three cores be tested. Cores shall be prepared and tested a described in IS:516. Concrete in the member represented by a core test shall be considered acceptable if the average equivalent cube strength of the cores is equal to at lest 85% of the cube strength of the fgrade of concrete specified for the corresponding age and no individual core has strength less than 75% of the specified strength.

(b) **Chloride and Sulphate Content**

The total chloride and sulphuric anhydride (SO_3) content of all the constituents of concrete as a percentage of mass of cement in the mix shall not exceed the values given in MoRT&H Specifications for Road & Bridge Works (Fifth Revision).

1.2.17 Quality Control Tests

Concrete to be used for the works should satisfy the quality control tests in accordance with Table 900-6 o MoRT&H Specifications for Road & Bridge Works (Fifth Revision) as under

S/ No	Type of Material	Test	IS Code	Frequency (Min)
1	Concrete	i) Strength of concrete	IS:516	2 cubes and 2 beams per 150 Cum or part thereof (one for 7 day and other for 28 day strength) or minimum 6 cubes and 6 beams per day's work whichever is more.
		ii) Core strength on hardened concrete	IS:516	As per the requirement of the Engineer-in-Charge/OC Contract, only in case of doubt.
		iii) Workability of fresh concrete - Slump test	IS:1199	One test per each dumper load at both batching plant site and paving site initially when work starts. Subsequently sampling may be done from alternate dumper.
		iv) Thickness determination		From the level data of concrete pavement surface and sub base at grid points of 5/6.25 m x 3.5 m.
		v) Thickness measurement for trial length		3 cores per trial length
		vi) Verification of level of string line in the case of slip form paving and steel forms in the case of fixed form paving		String line or steel forms shall be checked for level at an interval of 5.0 m or 6.25 m. The level tolerance allowed shall be plus or minus 2 mm. These shall be got approved 1-2 hours before the commencement of the concreting activity.

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1.3 HPS FILLING (BACK FILLING WITH STONE AGGREGATES) (Rate shall be measured in Cum)

1.3.1 Description

1.3.1.1 This works are consist of providing filter media behind abutment of culverts.

1.3.1.2 For proper movement of rain water without creating any uplift head behind abutment, a layer of stone/selected materials shall be well packed to a thickness of not less than 600 mm with smaller size towards the soil and bigger size towards the wall and provided over the entire surface behind abutment of culverts to the full height.

1.3.2 Construction Method

The lowest course of filter media shall be started from the toe and built up upwards. The construction of filter media shall closely follow the construction of structure however it shall be carried out in such a away as not to cause under thurst on any part of the structure like abutment of culverts.

1.4 STEEL REINFORCEMENT (UNTENSIONED) (Rate shall be measured in Kg)

1.4.1 Description

This work shall consist of furnishing and placing coated or uncoated high strength deformed reinforcement bars of the shape and dimensions shown on the drawings and conforming to these Specifications or as approved by the Engineer-in-Charge/OC Contract.

1.4.2 General

i) Steel for reinforcement shall meet with the requirements of Section 1000 of MoRT&H specifications (Fifth revision).

ii) Reinforcements may be high strength deformed bars. They may be uncoated or coated with epoxy.

iii) Reinforcements shall be cut and bend to shape and size as shown in drawings or directed by the Engineer-in-Charge/OC Contract.

1.4.3 Protection Of Reinforcement

i) Uncoated reinforcing steel shall be protected from rusting or chloride contamination. Reinforcements shall be free from rust, mortar, loose mill scale, grease, oil or paints. This may be ensured either by using reinforcement fresh from the factory or thoroughly cleaning it using any suitable method such as sand blasting, mechanical wire brushing, etc., as directed by the Engineer-in-Charge/OC Contract. Reinforcements shall be stored above the ground in a clean and dry condition, on blocks, racks or platforms and shall be suitably marked to facilitate inspection and identification.

ii) Portions of uncoated reinforcing steel and dowels projecting from concrete shall be protected within one week after initial placing of concrete, with a brush coat of neat cement mixed with water to a consistency of thick paint. This coating shall be removed

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by lightly tapping with a hammer or other tool not more than one week before placing of the adjacent pour of concrete. Coated reinforcing steel shall be protected against damage to the coating. If the coating on the bars is damaged during transportation or handling and cannot be repaired, the same shall be rejected.

iii) In case of fusion bonded epoxy coated reinforcement or hot dipped galvanized bars used, reference shall be made Clause 1010.3.2 of Section 1000 of of MoRT&H specifications (Fifth revision).

1.4.4 Bending of Reinforcement

i) Bar bending schedule shall be furnished by the Contractor and got approved by the Engineer-in-Charge/OC Contract before start of work.

ii) Reinforcing steel shall conform to the dimensions and shapes given in the approved Bar Bending Schedules.

iii) Bars shall be bent cold to the specified shape and dimensions or as directed by the Engineer-in-Charge/OC Contract using a proper bar bender, operated by hand or power to obtain the correct radii of bends and shape.

iv) Bars shall not be bent or straightened in a manner that will damage the parent material or the coating.

v) Bars bent during transport or handling shall be straightened before being used on work. They shall not be heated to facilitate straightening.

1.4.5 Placing Of Reinforcement

(a) The reinforcement cage should generally be fabricated in the yard at ground level and then shifted and placed in position. The reinforcement shall be placed strictly in accordance with the drawings and shall be assembled in position only when the structure is otherwise ready for placing of concrete. Prolonged time gap between assembling of reinforcements and casting of concrete, which may result in rust formation on the surface, shall not be permitted.

(b) Reinforcement bars shall be placed accurately in positions as shown on the drawings. The bars, crossing one another shall be tied together at every intersection with binding wire (annealed), conforming to IS: 280 to make the skeleton of the reinforcement rigid such that the reinforcement does not get displaced during placing of concrete, or any other operations. The diameter of binding wire shall not be less than 1 mm.

(c) Bars shall be kept in position usually by the following methods:

(i) In case of beam and slab construction, industrially produced polymer cover blocks of thickness equal to the specified cover shall be placed between the bars and formwork, subject to satisfactory evidence that the polymer composition is not harmful to concrete and reinforcement. Cover blocks made of concrete may be permitted by the Engineer-in-Charge/OC Contract, provided they have the same strength and specification as those of the member.

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(ii) In case of dowels for columns and walls, the vertical reinforcement shall be kept in position by means of timber templates with slots cut in them accurately, or with cover blocks tied to the reinforcement. Timber templates shall be removed after the concreting has progressed upto a level just below their location.

(iii) Layers of reinforcements shall be separated by spacer bars at approximately one metre intervals. The minimum diameter of spacer bars shall be 12 mm or equal to maximum size of main reinforcement or maximum size of coarse aggregate, whichever is greater. Horizontal reinforcement shall not be allowed to sag between supports.

(iv) Necessary stays, blocks, metal chairs, spacers, metal hangers, supporting wires etc, of other subsidiary reinforcement shall be provided to fix the reinforcements firmly in its correct position.

(v) Use of pebbles, broken stone, metal pipe, brick, mortar or wooden blocks etc., as devices for positioning reinforcement shall not be permitted.

(d) Bars coated with epoxy shall be placed on supports that do not damage the coating. Supports shall be installed in a manner such that planes of weakness are not created in hardened concrete. The coated reinforcing steel shall be held in place by use of plastic or plastic coated binding wires especially manufactured for the purpose. Refer Section 1000 of MoRT&H Specifications for road and bridge works (Fifth Revision) for other requirements.

(e) Placing and fixing of reinforcement shall be inspected and approved by the Engineer-in-Charge/OC Contract before concreting is commenced.

1.4.6 Bar Splices

Lapping : All reinforcement shall be furnished in full lengths as indicated on the drawing. No splicing of bars, except where shown on the drawing, will be permitted without approval of the Engineer-in-Charge/OC Contract. The lengths of the splice shall be as indicated on drawing or as approved by the Engineer-in-Charge/OC Contract. Where practicable, overlapping bars shall not touch each other, and shall be kept apart by 25 mm or 1¼ times the maximum size of coarse aggregates, whichever is greater. If this is not feasible, overlapping bars shall be bound with annealed steel binding wire, not less than 1 mm diameter and twisted tight in such a manner as to maintain minimum clear cover to the reinforcement from the concrete surface. Lapped splices shall be staggered or located at points, alongwith span where stresses are low.

1.4.7 Welding

i) Splicing by welding of reinforcement will be permitted only if detailed on the drawing or approved by the Engineer-in-Charge/OC Contract. Weld shall develop an ultimate strength equal to or greater than that of the bars connected.

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ii) While welding may be permitted for mild steel reinforcing bars conforming to IS: 432, welding of deformed bars conforming to IS: 1786 shall in general be prohibited. Welding may be permitted in case of bars of other than Fe 240 grade including special welding grade of Fe 415 grade bars conforming to IS:1786, for which necessary chemical analysis has been secured and the carbon equivalent (CE) calculated from the chemical composition ;using the formula :

$$CE = C + \frac{Mn}{6} + \frac{Cr+Mg+V}{5} + \frac{Ni+Cu}{15}$$

is 0.4 or less.

iii) The method of welding shall conform to IS: 2751 and ISL9417 and to any supplemental specifications and Clause 1904.8 of MoRT&H Specifications for Road & Bridge Works (Fifth Revision) to the satisfaction of the Engineer-in-Charge/OC Contract.

iv) Welding may be carried out by metal are welding process. Qxy-acetelene welding shall not be permissible. Any other process may be used subject to the approval of the Engineer-in-Charge/OC Contract and necessary additional requirements to ensure satisfactory joint performance. Precautions on overheating, choice of electrode, selection of correct current in arc welding etc., should be strictly observed.

v) All bars shall be butt welded except for smaller diameter bars (diameter of less than 20 mm) which may be lap welded. Single-V or Double-V butt joints may generally be used. For vertical bars single bevel or double bevel joints may be used.

vi) Welded joints shall be located well away from bends and not less than twice the bar diameter away from a bend.

vii) Generally, shop welding in controlled conditions is to be preferred, where feasible. Site welding where necessary shall, however, be permitted when the facilities, equipment, process, consumables, operators, welding procedure are adequate to produce and maintain uniform quality at par with that attainable in shop welding to the satisfaction of the Engineer-in-Charge/OC Contract.

viii) Joint welding procedures which are to be employed shall invariably be established by a procedure specification. All welders and welding operators to be employed shall have to be qualified by tests prescribed in IS: 2751. Inspection of welds shall conform to IS: 822 and destructive or non-destructive testing may be undertaken when deemed necessary. Joints with weld defects detected by visual inspection or dimensional check inspection shall not be accepted.

ix) 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. When welding is done in 2 or 3 stages, previous surface shall be cleaned properly. Bars shall be cleaned of all loose scale, rust, grease, paint and other foreign matter before carrying out welding. Only competent and experienced welders shall be employed on the work with the approval of the Engineer-in-Charge/OC Contract. No welding shall be done on coated bars.

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

xi) Welded joints shall preferably be located at points where steel will not be subject to more than 75 per cent of the maximum permissible stresses and welds so staggered that at any one section, not more that 20 per cent of the bars are welded.

xii) Welded pieces of reinforcement shall be tested. Specimens shall be taken from the site and the number and frequency of tests shall be as directed by the Engineer-in-Charge/OC Contract.

1.4.8 Mechanical Coupling of Bars

Bars may be jointed with approved patented mechanical devices as indicated on the drawing or as approved by the Engineer-in-Charge/OC Contract e.g. by special grade steel sleeves swaged on to bars in end to end contact or by screwed couplers. In case such devices are permitted by the Engineer-in-Charge/OC Contract, they shall develop at least 125 per cent of the characteristic strength of the reinforcement bar.

1.4.9 Anchorages

Bars may be anchored with approved patented mechanical anchorages as indicated on the drawings or as approved by the Engineer-in-Charge/OC Contract. The anchorages shall be connected to the reinforcing bar by the use of taper thread system. The anchorage shall be capable of developing the characteristic strength of reinforcement without damage to concrete and shall hace sufficient diameter and width to develop adequate shear cone strength. The conncetion shall develop 125% of the characteristic strength of reinforcement bar.

1.4.10 Testing And Acceptance

i) The materials shall be tested in accordance with relevant IS specifications and necessary test certificates shall be furnished. Additional tests, if required, will be got carried out by the Contractor at his own cost.

ii) The supply, fabrication and placing of reinforcement shall be in accordance with MoRT&H Specifications for Road & Bridge Works (Fifth Revision) and shall be checked and accepted by the Engineer-in-Charge/OC Contract.

iii) Manufacturer's test certificate regarding compliance with Indian Standards for each lot of steel shall be obtained and submitted to the Engineer-in-Charge/OC Contract. If required by the Engineer-in-Charge/OC Contract, the Contractor shall carry out confirmatory tests in the presence of a person authorized by the Engineer-in-Charge/OC Contract. Cost of these tests shall be borne by the Contractor. The sampling and testing procedure shall be as laid down in IS:1786. If any test piece selected from a lot fails, no re-testing shall be done and the lot shall be rejected.

1.4.11 Measurements For Payment

Reinforcement shall be measured in length including hooks, if any, separately for different diameters as actually used in work, excluding overlaps. From the length so measured, the weight of reinforcement shall be calculated in Kg on the basis of IS: 1732. Wastage, overlaps, couplings, welded joints, spacer bars, chairs, stays, hangers and annealed steel wire or other methods for binding and placing shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.

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1.5 FORM WORK (Rate shall be measured in Sqm)

Scope this work shall include centering/shuttering (steel) including strutting, propping and removal of form work. Section 1500 of MoRT&H specification for Road and Bridges works (Fifth Revision) generally be followed in case of any doubt.

1.5.1 Description

Formwork shall include all temporary or permanent forms required for forming the concrete of the shape, dimensions and surface finish as shown on the drawing or as directed by the Engineer-in-Charge/OC Contract, together with all props, staging, centering, scaffolding and temporary construction required for their support. The design, erection and removal of formwork shall conform to IRC: 87 “Guidelines for Design and Erection of Falsework for Road Bridges” and MoRT&H Specifications for Road & Bridge Works (Fifth Revision).

1.5.2 Materials

i) All materials shall comply with the requirements of IRC: 87. Materials and components used for formwork shall be examined for damage or excessive deterioration before use/re-use and shall be used only if found suitable after necessary repairs. In case of timber formwork, the inspection shall not only cover physical damages but also signs of attacks by decay, rot or insect attack or the development of splits.

ii) Form shall be constructed with metal or timber. The metal used for forms shall be of such thickness that the forms remain true to shape. All bolts should be countersunk. The use of approved internal steel ties or steel or plastic spacers shall be permitted. Structural steel tubes used as support for forms shall have a minimum wall thickness of 4 mm. Other materials conforming to the requirements of IRC: 87 may also be used if approved by the Engineer-in-Charge/OC Contract.

1.5.3 Design Of Formwork

i) The design, erection and removal of formwork shall conform to IRC:87 “Guidelines for Formwork, False and Temporary Structures” and MoRT&H Specifications for Road & Bridge Works (Fifth Revision). The forms shall be such as to ensure that they can be conveniently removed without disturbing the concrete. The design shall facilitate proper and safe access to all parts of formwork for inspection.

ii) The Contractor shall furnish the design and drawing of complete formwork (i.e. the forms as well as their supports) for approval of the Engineer-in-Charge/OC Contract before any erection is taken up. If proprietary system of formwork is used, the Contractor shall furnish detailed information as per Appendix 1500/I to the Engineer-in-Charge/OC Contract for approval.

iii) Notwithstanding any approval or review of drawing and design by the Engineer-in-Charge/OC Contract, the Contractor shall be entirely responsible for the adequacy and safety for formwork.

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1.5.4 Workmanship

i) The formwork shall be robust and strong and the joints shall be leak-proof.

ii) Ballies shall not be used as staging. Staging must have cross bracings and diagonal bracings in both directions. Staging shall be provided with an appropriately designed base plate resting on firm strata.

iii) The number of joints in the formwork shall be kept to a minimum by using large size panels. The design shall provide for proper “soldiers” to facilitate alignment. All joints shall be leak proof and must be properly sealed. Use of PVC Joint sealing tapes, form rubber or PVC T-section, is essential to prevent leakage of grout.

iv) As far as practicable, clamps shall be used to hold the forms together. Where use of nails is unavoidable minimum number of nails shall be used and these shall be of the double headed type. Alternatively, if the nails are of normal type, they shall be left partially projecting without being driven to their full length, so that they can be withdrawn easily.

v) Use of ties shall be restricted, as far as practicable. Wherever ties are used they shall be used with HDPE sheathing so that the ties can easily be removed. No parts prone to corrosion shall be left projecting or near the surface. The sheathing shall be grouted with cement mortar of the same strength as that of the structure.

vi) Unless otherwise specified, or directed, chamfers or fillets of sizes 25 mm x 25 mm shall be provided at all angles of the formwork to avoid sharp corners. The chamfers, beveled edges and mouldings shall be made in the formwork itself. Opening for fixtures and other fittings shall be provided in the shuttering as directed by the Engineer-in-Charge/OC Contract.

vii) Shuttering for walls, sloping members and thin sections of considerable height shall be provided with temporary openings to permit inspection and cleaning out before placing of concrete.

viii) The formwork shall be constructed with pre-camber to the soffit to allow for deflection of the formwork. This shall be in addition to the pre-camber for the permanent structure as shown on the drawings.

ix) Where centering trusses or launching trusses are adopted for casting of superstructure, the joints of the centering trusses, whether welded, riveted or bolted should be thoroughly checked periodically. Also, various members of the centering trusses should be periodically examined for proper alignment and unintended deformation before proceedings with the concerting. They shall also be periodically checked for any deterioration in quality due to steel corrosion. Launching truss, casting truss of span more than 40 m and travelling forms, shall be load tested before they are put to use.

x) The formwork shall be so made as to produce a finished concrete true to shape, line and levels and dimensions as shown on the drawings, subject to the tolerances specified in respective sections of these specifications, or as directed by the Engineer-in-Charge/OC Contract.

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xi) Where metal forms are used, all bolts and rivets shall be countersunk and well ground to provide a smooth, plane surface. Where timber is used it shall be well seasoned, free from loose knots, projecting nails, splits or other defects that may mar the surface of concrete.

xii) Forms 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 during and after placing the concrete. Screw jacks or hard wood wedges where required shall be provided to make up any settlement in the formwork either before or during the placing of concrete.

xiii) The formwork shall ensure the correct final shape of the structure, with the calculated amount of positive or negative camber.The deformation of falsework, scaffolding or propping and the instantaneous or deferred deformation due to various causes arising in prestressed structures, shall be properly accounted for.

xiv) Suitable camber shall be provided to horizontal members of structure, specially in long spans to counteract the effects of deflection. The formwork shall be so fixed as to provide for such camber.

xv) The formwork shall be coated with an approved release agent that will effectively prevent sticking and will not stain the concrete surface. Lubricating oils (machine oils) shall be prohibited for use as coating.

1.5.5 Lining of Formwork

The formwork shall be lined with material approved by the Engineer-in-Charge/OC Contract so as to provide a smooth finish of uniform texture and appearance. This material shall leave no stain on the concrete and shall be so fixed to its backing as not to impart any blemishes. It shall be of the same type and obtained from only one source throughout for the construction of any one structure. The contractor shall make good any imperfections in the resulting finish as required by the Engineer-in-Charge/OC Contract. Internal ties and embedded metal parts shall be carefully detailed and their use shall be subject to the approval of the Engineer-in-Charge/OC Contract.

1.5.6 Precautions

The following precautions shall be observed:-

(i) It shall be ensured that any cut-outs or openings provided in any structural member to facilitate erection of formwork, are closed with the same grade of concrete as that of the structure, after formwork is removed.

(ii) Provision for safe access to the formwork shall be made at all levels as required.

(iii) Close watch shall be maintained to check for settlement of formwork during concreting and any settlement shall be promptly rectified.

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(iv) Natural ground shall be checked for bearing capacity and likely settlement before erection of the staging.

(v) It shall be ensured that water used for curing or rain water does not stagnate near the base plate of the staging.

(vi) For shutters used for deep and narrow member, temporary openings in the sides shall be provided to facilitate pouring and compaction of concrete.

1.5.7 Preparation Of Formwork Before Concreting

1.5.7.1 The inside surfaces of forms shall, except in the case of permanent form work or where otherwise agreed to by the Engineer-in-Charge/OC Contract be coated with a release agent supplied by approved manufacturer or of an approved material to prevent adhesion of concrete to the formwork. 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 or prestressing tendons and anchorages. Different release agents shall not be used in formwork for exposed concrete. Before re-use of forms, the following actions shall be taken:

(i) The contact surfaces of the forms shall be cleaned carefully and dried before applying a release agent.

(ii) It should be ensured that the release agent is appropriate to the surface to be coated. The same type and make of release agent shall be used throughout on similar formwork materials and different types should not be mixed.

(iii) The form surfaces shall be evenly and thinly coated with release agent. The vertical surface shall be treated before horizontal surface and any excess wiped out.

(iv) It shall be ensured that the reinforcement or the surface of the hardened concrete shall not come in contact with the release agent.

1.5.7.2 All forms shall be thoroughly cleaned immediately before concreting.

1.5.7.3 The Contractor shall give the Engineer-in-Charge/OC Contract due notice before placing any concrete in the forms to permit him to inspect and approve the formwork. However, such inspection shall not relieve the contractor of his responsibility for safety of formwork, men, machinery, materials and finish or tolerances of concrete.

1.5.8 Removal Of Formwork

i) The scheme for removal of formwork (i.e. de-shuttering and de-centering) shall be planned in advance and furnished to the Engineer-in-Charge/OC Contract for scrutiny and approval. No formwork or any part thereof shall be removed without prior approval of the Engineer-in-Charge/OC Contract.

ii) The formwork shall be so removed as not to cause any damage to concrete. Centering shall be gradually uniformly lowered in such a manner as to permit the concrete to take stresses due to its own weight uniformly and gradually to avoid any shock or vibration.

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iii) Form work shall not be released unless the concrete has achieved strength of at least twice the stress the concrete may be subjected at the time of the removal of formwork. When no test is conducted for determination of strength of concrete and where the time of removal of formwork is not specified, the sme shall be as under :-

(a)	Walls, piers, abutments, columns and vertical faces of structural members	12 to 48 hours as may be decided by the Engineer-in-Charge/OC Contract
(b)	Soffits of Slabs (with props left under)	3 days
(c)	Props (left under slabs)	14 days
(d)	Soffit of Girders (with props left under)	7 days
(e)	Props (Left under girders)	21 days

iv) The above time schedule is applicable when Ordinary Portland Cement is used without any admixtures at an ambient temperature exceeding 10°C.

v) 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 shrinkage of concrete.

vi) Additional precautions as given in Clause 8.17 of IRC:87, shall also be followed.

1.5.9 Re-Use of Formworks

i) When formwork is dismantled, its individual components shall be examined for damage and damaged pieces shall be removed for rectification. Such examination shall always be carried out before being used again. Before re-use all components shall be cleaned of deposits of soil, concrete or other unwanted materials. Threaded parts shall be oiled after cleaning.

ii) All bent steel props shall be straightened before re-use. The maximum deviation from straightness is 1/600 of the length. The maximum permissible axial loads in used props shall be suitably reduced depending upon their condition. The condition of the timber components, plywood and steel shuttering plates shall be examined closely for distortion and defects before re-use.

iii) For slipform, the rate of climb of the formwork shall be designed for each individual case taking into account various parameters including the grade of concrete, concrete strength, concrete temperature, ambient temperature, concrete admixtures, etc.

iv) In order to verify the time and sequence of striking/removal of specialized formwork, routine field tests for the consistency of concrete and strength development are mandatory.

v) For specialized formwork, the form lining material may be either plywood or steel sheet of appropriate thickness.

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1.5.10 Tests And Standards Of Acceptance

i) The materials shall be tested in accordance with MoRT&H Specifications for Road & Bridge Works (Fifth Revision) and shall meet the prescribed criteria.

ii) The work shall conform to MoRT&H Specifications for Road & Bridge Works (Fifth Revision) and shall meet the prescribed standards of acceptance.

1.6 WEEP HOLE (Rate shall be measured in RM)

Weep holes shall be provided in all plain concrete, reinforced concrete, brick/stone masonry structures as shown on the drawing or as directed by the Engineer-in-Charge/OC Contract to permit water to flow out without building up pressure in the back fill. Weep holes of size 4"x4" shall be provided with 4" dia PVC pipe for structures in plain/reinforced concrete or brick/masonary structures. Weep holes shall be extend through the full width of concrete/masonry with slop of about 1 vertical : 20 horizontal towards the draining face. The spacing of weep holes shall be 1 m in either direction or as shown in the drawings with the lowest at 150 mm above the low water level or ground level whichever is higher or as directed by the Engineer-in-Charge/OC Contract.

1.6.1 Tests And Standards Of Acceptance

The materials shall be tested in accordance with these Specifications and shall meet the prescribed criteria and requirements.The work shall conform to these Specifications and shall meet the prescribed standards of acceptance.

1.7 MATERIAL

1.7.1 General

1.7.1.1 Materials to be used in the work shall conform to the specifications mentioned hereunder/on the drawings, the requirements laid down in this section and specifications for relevant items of work.

1.7.1.2 If any material, not covered in these specifications, is required to be used in the work, it shall conform to relevant Indian Standards, if there are any, or to the requirements specified by the Engineer-in-Charge/OC Contract.

1.7.2 Sources Of Material

1.7.2.1 The Contractor shall identify the source of materials like coarse aggregate and fine aggregate and notify the Engineer-in-Charge/OC Contract regarding the proposed sources prior to delivery.

1.7.2.2 Samples of materials from the source shall be tested in the presence of Engineer-in-Charge/OC Contract for conformity to specifications. It shall also be ensured that the variation in test results of different samples, is within acceptable limit.

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1.7.3 STONE

1.7.3.1 Stones shall be of the type specified. They shall be hard, sound, free from cracks, decay and weathering and shall be freshly quarried from an approved quarry. Stone with round surface shall not be used.

1.7.3.2 The stones, when immersed in water for 24 hours, shall not absorb water of more than 5 percent of their dry weight when tested in accordance with IS:1124.

1.7.3.3 The length of stone shall not exceed three times its height and the width on the base shall not ne greater than three-fourth of the thickness of the wall nor less than 150 mm.

1.7.4 COARSE AGGREGATES

i) For plain and reinforced cement concrete (PCC and RCC) works, coarse aggregate shall consist of clean, hard, strong, dense, non-porous and durable pieces of crushed stone, crushed gravel, natural gravel or a suitable combination thereof or other approved inert material. They shall not consist pieces of disintegrated stones, soft, flaky, elongated particles, salt, alkali, vegetable matter or other deleterious materials in such quantities as to reduce the strength and durability of the concrete, or to attack the steel reinforcement. Coarse aggregate having positive alkali-silica reaction shall not be used. All coarse aggregates shall conform to IS: 383 and tests for conformity shall be carried out as per IS: 2386, Parts I to VIII.

ii) The contractor shall submit for the approval of the Engineer-in-Charge/OC Contract, the entire information indicated in Appendix 'A' of IS: 383.

iii) Maximum nominal size of coarse aggregate for various structural components in PCC, RCC, shall conform to Section 1700 of MoRT&H specifications (Fifth Revision).

iv) The maximum value for flakiness index for coarse aggregate shall not exceed 35 per cent. The coarse aggregate shall satisfy the following grading as given in table 1000-1 of MoRT&H specifications (Fifth Revision).

GRADING REQUIREMENTS OF COARSE AGGREGATE: TABLE 1000-1

IS Sieve Size	Per cent by Weight Passing the Sieve		
	40mm	20mm	12.5mm
63 mm	-	-	-
40 mm	95-100	100	-
20 mm	30-70	95-100	100
12.5 mm	-	-	90-100
10 mm	10-35	25-55	40-85
4.75 mm	0-5	0-10	0-10

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1.7.5 SAND/FINE AGGREGATES

i) Natural sand, crushed stone sand or crushed gravel sand or a suitable combination of natural sand, crushed stone or gravel, shall be used as fine aggregates in plain and reinforced concrete works. The fine aggregates shall be dense, durable, clean and free from veins and adherent coating and other deleterious substances. They shall not contain dust, lumps, soft or flaky materials, mica or other deleterious materials in such quantities as to reduce the strength and durability of the concrete, or to attack the embedded steel. Mechanised sand washing machines should be used to remove impurities from sand. Fine aggregates having positive alkali-silica reaction shall not be used. All fine aggregates shall conform to IS: 383 and tests for conformity shall be carried out as per IS:2386 (Part I to VIII). The Contractor shall submit to the Engineer-in-Charge/OC Contract the entire information indicated in Appendix 'A' of IS: 383. The fineness modulus of fine aggregate shall neither be less than 2.0 nor greater than 3.5.

ii) Sand/fine aggregate for structural concrete shall conform to the following grading requirements:

IS Sieve Size	Per cent by Weight Passing the Sieve		
	Zone I	Zone II	Zone III
10 mm	100	100	100
4.75 mm	90-100	90-100	90-100
2.36 mm	60-95	75-100	85-100
1.18 mm	30-70	55-90	75-100
600 micron	15-34	35-59	60-79
300 micron	5-20	8-30	12-40
150 micron	0-10	0-10	0-10

1.7.5.1 **Quality Control Test**

Coarse and fine aggregates to be used for the works should satisfy the Quality control Tests in accordance with Table 900-6 of MoRT&H Specifications for road and bridge works (fifth Revision) as under:-**TABLE 900-6**

S/No	Type of Material	Test	IS Code	Frequency (Min)
1	Coarse and Fine Aggregates	i) Gradation	IS:2386	One test for every day's work of each fraction of coarse and fine aggregate, initially; May be relaxed later at the discretion of the Engineer-in-Charge/OC Contract.
		ii) Deleterious constituents	IS:2386 (Part-2)	One test for every day's work of each fraction of coarse and fine aggregate, initially; May be relaxed later at the discretion of the Engineer-in-Charge/OC Contract.

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S/No	Type of Material	Test	IS Code	Frequency (Min)
	Coarse and Fine Aggregates	iii) Water absorption	IS:2386 (Part-3)	As required subject to a minimum of one test a day for coarse aggregate and two tests a day for fine aggregate. This data shall be used for correcting the water demand of the mix on daily basis.
2	Coarse aggregate	i) Los Angeles abrasion value or AIV test	IS:2386 (Part-4)	Once for each source of supply and subsequently on monthly basis.
		ii) Soundness	IS:2386 (Part-5)	Before approving and every month subsequently.
		iii) Alkali aggregate reactivity	IS:2386 (Part-7)	-do-

1.7.6 WATER

1.7.6.1 Water used for mixing and curing shall be clean and free from oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel conforming to clause 1010 of MoRT&H Specifications for Road & Bridge works (Fifth Revision).

1.7.6.2 pH value of water shall not be less than 6. Potable water is generally considered satisfactory for mixing concrete. Mixing and curing with sea water shall not be permitted. As a guide, the following concentrations represent the maximum permissible values :-

(a) To neutralize 100 ml sample of water, using phenolphthalein as an indicator, it should not require more than 5 ml of 0.02 normal NaOH. For details of test refer IS:3025 (Part 22).

(b) To neutralize 100 ml sample of water, using mixed indicator, it should not require more than 25 ml of 0.2 normal H2SO4. For details of test refer IS:3025 (Part 23).

(c) The permissible limits for solids shall be as follows

	Permissible Limits (max)	Tested as Per
Organic	200 mg/lit	IS:3025(Pt.18)
Inorganic	3000 mg/lit	IS:3025(Pt.18)
Sulphates ($SO3_4$)	400 mg/lit	IS:3025(Pt.18)
Chlorides (Cl)	2000 mg/lit for concrete work not containing embedded steel and 500 mg/lit for prestressed/ reinforced concrete work.	IS:3025(Pt.18)
Suspended Matter	2000mg/lit	IS:3025(Pt.17)

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1.7.6.3 Quality Control Test

Water to be used for the works should satisfy the Quality control Tests in accordance with Table 900-6 of MoRT&H Specifications for road and bridge works (fifth Revision) as under:-

S/No	Type of Material	Test	IS Code	Frequency (Min)
(a)	Water	Chemical tests	IS:2386	Once for approval of source of supply, subsequently only in case of doubt.

1.7.7 TIMBER

The timber used for structural purposes shall conform to IS: 883.

1.7.8 Tests And Standard Of Acceptance

i) All materials, even though stored in an approved manner shall be subjected to an acceptance test in accordance with the relevant IS specifications prior to their immediate use.

ii) Independent testing of cement for every consignment shall be done by the Contractor at site in the laboratory approved by the Engineer-in-Charge/OC Contract before use. Any cement with lower quality than that shown in manufacturer's certificate shall be debarred from use. In case of imported cement, the same series of tests shall be carried out before acceptance.

1.7.9 Testing And Approval Of Material

i) The Contractor shall furnish test certificates from the manufacturer/supplier of materials along with each batch of materials(s) delivered to site.

ii) The Contractor shall set up a field laboratory with necessary equipment for testing of all materials, finished products used in the construction as per requirements of conditions of contract and the relevant specifications. The testing of all the materials shall be carried out by the Engineer-in-Charge/OC Contract for which the Contractor shall make all the necessary arrangements and bear the entire cost.

iii) Tests which cannot be carried out in the field laboratory have to be got done at the Contractor's cost at any recognized laboratory/testing establishments approved by the Engineer-in-Charge/OC Contract.

1.7.10 Sampling Of Materials

i) Samples provided to the Engineer-in-Charge/OC Contract for inspection are to be in labelled boxes suitable for storage.

ii) Samples required for approval and testing must be supplied well in advance by at least 48 hours or before the minimum period required for carrying out the relevant tests. Delay to works arising from the late submission of samples will not be acceptable as a reason for delay in the completion of the works.

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iii) If materials are brought from abroad, the cost of sampling/testing whether in India or abroad shall be borne by the Contractor.

1.7.11 Rejection Of Materials Not Conforming To The Specifications

Any stack or batch of material (s) of which samples (s) does (do) not conform to the prescribed tests and quality shall be rejected by the Engineer-in-Charge/OC Contract and such materials shall be removed from site by the Contractor at his own cost. Such rejected materials shall not be made acceptable by any modifications.

1.7.12 Testing And Approval Of Plant And Equipment

All plants and equipment used for preparing, testing and production of materials for incorporation into the permanent works shall be in accordance with manufacturer's specifications and shall be got approved by the Engineer-in-Charge/OC Contract before use.

1.8 QUALITY CONTROL

For quality control of the work provision of Section-900 of MoRT&H publication on "Specification on Road & Bridge work" (Fifth Revision) shall be followed. Various tests as specified therein shall be conducted at the expense of the contractor as per the frequency specified for each. Suitable laboratory at site be established by the contractor to facilitate conduct of these tests.

1.8.1 QUALITY CONTROL FOR ROAD WORKS

1.8.1.1 General

i) All materials to be used, all methods adopted and all works performed shall be strictly in accordance with the requirements of these Specifications. The Contactor shall set up a field laboratory at locations approved by the Engineer-in-Charge/OC Contract and equip the same with adequate equipment and personnel in order to carry out all required tests and Quality Control work as per Specifications and/or as directed by the Engineer-in-Charge/OC Contract. The internal layout of the laboratory shall be as per Clause 120 of MoRT&H Specifications for road and Bridge works (Fifth Revision) and/or as directed by the Engineer-in-Charge/OC Contract. The list of equipment and the facilities to be provided shall be got approved from the Engineer-in-Charge/OC Contract in advance.

ii) The Contractor's laboratory should be manned by a qualified Materials Engineer-in-Charge/OC Contract/Civil Engineer-in-Charge/OC Contract assisted by experienced technicians, and the set-up should be got approved by the Engineer-in-Charge/OC Contract.

iii) The Contractor shall carry out quality control tests on the materials and work to the frequency stipulated in subsequent paragraphs. In the absence of clear indications about method and / or frequency of tests for any item, the instructions of the Engineer-in-Charge/OC Contract shall be followed.

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iv) For satisfying himself about the quality of the materials and work, quality control tests will also be conducted by the Engineer-in-Charge/OC Contract (by himself, by his Quality Control units or by any other agencies deemed fit by him), generally to the frequency set forth herein under. Additional tests may also be conducted where, in the opinion of the Engineer-in-Charge/OC Contract, need for such test exists.

v) The Contractor shall provide necessary co-operation and assistance in obtaining the samples for tests and carrying out the field tests as required by the Engineer-in-Charge/OC Contract from time to tome. This may include provision of labour, attendants, assistance in packing and dispatching and any other assistance considered necessary in connection with the tests.

vi) For the work of embankment, subgrade and pavement, construction of subsequent layer of same or other material over the finished layer shall be done after obtaining permission from the Engineer-in-Charge/OC Contract. Similar permission from the Engineer-in-Charge/OC Contract shall be obtained in respect of all other items of works prior to proceeding with the next stage of construction.

vii) The Contractor shall carry out modifications in the procedure of work, if found necessary, as directed by the Engineer-in-Charge/OC Contract during inspection. Works falling short of quality shall be rectified/redone by the Contractor at his own cost, and defective work shall also be removed from the site of works by the Contractor at his own cost.

viii) The cost of laboratory building including services, essential supplies like water, electricity, sanitary services and their maintenance and cost of all equipment, tools, materials, labour and incidentals to perform tests and other operations of quality control according to the Specification requirements shall be deemed to be incidental to the work and no extra payment shall be made for the same. If, however, there is a separate item in the Bill of Quantities for setting up of a laboratory and installing testing equipment, such work shall be paid for separately.

ix) For testing of samples of soils/soil mixes, granular materials, and mixes, bituminous materials and mixes, aggregates, cores etc., samples in the required quality and form shall be supplied to the Engineer-in-Charge/OC Contract by the Contractor at his own cost.

x) For testing of cement concrete at site during construction, arrangements for supply of samples, sampling, testing and supply of test results shall be made by the Contractor as per the frequency and number of tests specified in the Handbook of Quality Control for Construction of Roads and Runways (IRC: SP: 11) and relevant IS Codes or relevant clauses of these Specifications, the cost of which shall be borne by the Contractor.

xi) The method of sampling and testing of materials shall be as required by the “Handbook of Quality Control for Construction of Roads and Runways” (IRC: SP: 11), and MoRT&H specifications for road and bridge works (Fifth Revision). Where they

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are contradicting, the provision in these Specifications shall be followed. Where they are silent, sound Engineer-in-Charge/OC Contracting practices shall be adopted. The sampling and testing procedure to be used shall be as approved by the Engineer-in-Charge/OC Contract and his decision shall be final and binding on the Contractor.

xii) The quarry of materials for embankment construction shall be got approved from the Engineer-in-Charge/OC Contract. The responsibility for arranging and obtaining the land for borrowing or exploitation in any other way shall rest with the Contractor who shall ensure smooth and uninterrupted supply of materials in the required quality during the construction period.

xiii) Similarly, the supply of aggregates for construction of road pavement shall be from quarries approved by the Engineer-in-Charge/OC Contract. Responsibility for arranging uninterrupted supply of materials from the source shall be that of the Contractor.

1.8.1.2 Defective Materials

All materials which the Engineer-in-Charge/OC Contract/his representative has determined as not conforming to the requirements of the Contract shall be rejected whether in place or not; they shall be removed immediately from the site as directed. Materials, which have been subsequently corrected, shall not be used in the work unless approval is accorded in writing by the Engineer-in-Charge/OC Contract. Upon failure of the Contractor to comply with any order of the Engineer-in-Charge/OC Contract/his representative, given under this Clause, the Engineer-in-Charge/OC Contract/his representative shall have authority for removal of rejected material and to deduct the removal cost thereof from any payments due to the Contractor.

1.8.1.3 Imported Materials

i) At the time of submission of tenders, the Contractor shall furnish a list of materials/finished products manufactured, produced or fabricated outside India which he proposes to use in the work. The Contractor shall not be entitled to extension of time for acts or events occurring outside India and it shall be the Contractor's responsibility to make timely delivery to the job site of all such materials obtained from outside India.

ii) The materials imported from outside India shall conform to the relevant Specifications of the Contract. In case where materials/finished products are not covered by the Specifications in the Contract, the details of Specifications proposed to be followed and the testing procedure as well as laboratories/ establishments where tests are to be carried out shall be specifically brought out and agree to in the Contract.

iii) The Contractor shall furnish to the Engineer-in-Charge/OC Contract a certificate of compliance of the tests carried out. In addition, certified mill test reports clearly indentified to the lot of materials shall be furnished at the Contractor's cost.

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1.9 DRAWING OF PERMANENT WORKS

Drawings of permanent works such as RCC culverts of 2 m span can be ontained from Headquarters Project Dantak Office for reference and guidance purpose. However, drawings for structure will be provided by OC Contract to execute work at the time of execution. Contractor shall execute work as per drawing provided by OC Contract.

2. SURFACING WORKS

2.1 CONTROL OF ALIGNMENT, LEVEL AND SURFACE REGULARITY

2.1.1 General

All works performed shall conform to the lines, grades, cross sections and dimensions shown on the drawings or as directed by the Engineer-in-Charge/OC Contract, subject to the permitted tolerances described herein-after.

2.1.2 Horizontal Alignment

Horizontal alignments shall be reckoned with respect to the centre line of the carriageway as shown on the drawings. The edges of the carriageway as constructed shall be correct within a tolerance of ±10 mm there from. The corresponding tolerance for edges of the roadway and lower layers of pavement shall be ±25 mm.

2.1.3 Surface Levels

i) The levels of the subgrade and different pavement courses as constructed, shall not vary from those calculated with reference to the longitudinal and cross-profile of the road shown on the drawings or as directed by the Engineer-in-Charge/OC Contract beyond the tolerances mentioned in Table 900-1 MoRT&H specifications for road and bridge works (Fifth Revision).

Table 900-1. Tolerances in surface levels

1.	Subgrade	± 20 mm
2.	Sub-base	
	(a) Flexible pavement	± 10 mm
	(b) Concrete pavement	± 6 mm
3.	Base-course for flexible pavement	
	(a) Bituminous Base/Binder course	± 6 mm
	(b) Granular	
	(i) Machine laid	± 10 mm
	(ii) Manually laid	± 15 mm

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4. Wearing course for flexible pavement
   (a) Machine laid ± 6 mm
   (b) Manually laid ± 10 mm

ii) Provided, however, that the negative tolerance for wearing course shall not be permitted in conjunction with the positive tolerance for base course, if the thickness of the former is thereby reduced by more than the following limits :-

(a) 4 mm for bituminous wearing course of thickness 40 mm or more.
(b) 3 mm for bituminous wearing course of thickness less than 40 mm.

iii) For checking compliance with the above requirement for subgrade, sub-base and base courses, measurements of the surface levels shall be taken on a grid of points placed at 6.25 m longitudinally and 3.5 m transversely. For any 10 consecutive measurements taken longitudinally or transversely, not more than one measurement shall be permitted to exceed the tolerance as above, this one measurement being not in excess of 5 mm above the permitted tolerance.

iv) For checking the compliance with the above requirement for bituminous wearing courses and concrete pavements, measurements of the surface levels shall be taken on a grid of points space at 6.25 mm along the length and at 0.5 mm from the edges and at the centre of the pavement. In any length of pavement, compliance shall be deemed to be met for the final road surface, only if the tolerance given above is satisfied for any point on the surface.

2.1.4 Surface Regularity Of Pavement Courses

i) The longitudinal profile shall be checked with a 3 metre long straight edge/moving straight-edge as desired by the Engineer-in-Charge/OC Contract at the middle of each traffic lane along a line parallel to the centre line of the road.

i) The maximum permitted number of surface irregularities shall be as per Table 900-2 MoRT&H specifications for road and bridge works (Fifth Revision).

Surfaces of carriageways and paved shoulders					**Surfaces of laybye, service areas and all bituminous base courses**			
Irregularity	4 mm		7 mm		4 mm		7 mm	
Length (m)	300	75	300	75	300	75	300	75
National Highways/ Expressways	15	9	2	1	40	18	4	2
Roads of lower category	40	18	4	2	60	27	6	3

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iii) The maximum allowable difference between the road surface and underside of a 3 m straight-edge when placed parallel with, or at right angles to the centre line of the road at points decided by the Engineer-in-Charge/OC Contract shall be:

For pavement surface (bituminous and cement concrete)	3 mm
for DBM/bituminous base courses	6 mm
for granular sub base/base course	8 mm
for sub-bases under concrete pavements	10 mm
for subgrade	15 mm

2.1.5 Rectification

Where the surface regularity of subgrade and the various pavement courses fall outside the specified tolerances in Clause 902.4 of MoRT&H specifications for road and bridge works (Fifth Revision), the Contractor shall be liable to rectify these in the manner described below and to the satisfaction of the Engineer-in-Charge/OC Contract.

(i) **Subgrade :** Where the surface is high, it shall be trimmed and suitably compacted. Where the same is low, the deficiency shall be corrected by scarifying the lower layer and adding fresh material and recompacting to the required density. The degree of compaction and the type of material to be used shall conform to the requirements of Clauses 305 of MoRT&H Specifications for road and Bridge works (Fifth Revision).

(ii) **GSB/SUB BASE :** Same as at (i) above, except that the degree of compaction and the type of material to be used shall conform to the requirements of Clauses 401 of MoRT&H Specifications for road and Bridge works (Fifth Revision).

(iii) **WMM/Base :** Where the surface is high or low, the top 75 mm shall be scarified, reshaped with added materials as necessary and recompacted as per Clause 406 of MoRT&H Specifications for road and Bridge works (Fifth Revision).

(iv) **Bituminous Constructions :** For bituminous construction other than wearing course, where the surface is low, the deficiency shall be corrected by adding fresh materials over a suitable tack cost, if needed, and recompacting as per specifications. Where the surface is high, the extra thickness in the affected layer shall be removed and replaced with fresh material and compacted to specifications.

For wearing course, where the surface is high or low, the full depth of the layer shall be removed and replaced with fresh material and compacted to specifications. In all cases where the removal and replacement of a bituminous layer is involved, the area treated shall not be less than 5 m in length and not less than 3.50 m in width.

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2.2 WET MIX MACADAM

2.2.1 Scope: This work shall consist of laying and compacting clean, crushed, graded aggregate and granular material, premixed with water, to a dense mass of compacted thickness on a prepared subgrade/sub-base/base or existing pavement as the case may be in accordance with the requirements of these specifications. The material shall be laid in three layers as necessary to lines, grades and cross-sections shown on the approved drawings or as directed by the Engineer-in-Charge/OC Contract.

2.2.2 Materials

2.2.2.1 Aggregates

2.2.2.1.1 Physical requirements: Coarse aggregates shall be crushed stone. If crushed gravel/shingle is used, not less than 90 % by weight of the gravel/shingle pieces retained on 4.75 mm sieve shall have at least two fractured faces. The aggregates shall conform to the physical requirements set forth in Table 400-12 of MoRT&H Specifications for Road and Bridge Works (Fifth Revision).

2.2.2.1.2 If the water absorption value of the coarse aggregate is greater tha 2%, the soundness test shall be carried out on the material delivered to site as per IS : 2386 (Part-5).

Table 400-12 : Physical Requirements of Coarse aggregates for Wet Mix Macadam for sub-base/Base Course

S./No.	Test	Test Method	Requirements
1.	Los Angeles Abrasion value or	IS : 2386 (Part-4)	40 % (Max)
	* Aggregate impact value	IS : 2386 (Part-4) or IS : 5640	30 % (Max)
2.	Combined Flakiness and Elongation indices (Total)	IS : 2386 (Part-I)	30 % (Max)

* To determine this combined proportion, the flaky stone from a representative sample should first be separated out. Flakiness index is weight of flaky stone metal divided by weight of stone sample. Only the elongated particles be separated out from the remaining (non- flaky) stone metal. Elongation index is weight of elongated particles divided by total non-flaky particles. The value of flakiness index and elongation index so found are added up.

2.2.2.1.3 Grading requirements : The aggregates shall confirm to the following grading as per Table 400-13 of MoRT&H Specifications for Road and Bridge Works (Fifth Revision):-

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IS Sieve Designation	% age bu weight passing the IS Sieve
53.00 mm	100
45.00 mm	95-100
26.50 mm	-
22.40 mm	60-80
11.20 mm	40-60
4.75 mm	25-40
2.36 mm	15-30
600.00 micron	8-22
75.00 micron	0-5

Material finer than 425 micron shall have Plasticity Index (PI) not exceeding 6.

The final gradation approved within these limits shall be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa.

2.2.3 Job Mix Frmula : The contractor shall submit to the Engineer-in-Charge/OC Contract for approval at least 21 days before the start of the work, the job mix formula proposed to be used for use in the work and shall give the following details :

(a) Source and location of all materials.
(b) Proportions of all materials expressed as follows where each is Applicable
  (i) Coarse/fine aggregate as percentage by weight of total aggregate.
  (ii) Water as percentage by weight of total mix.
(c) A single definite percentage passing each sieve for the mixed aggregate.

2.2.4 Construction Operations

2.2.4.1 Preparation of base : The surface of the sub-base/base to receive the Wet Mix Macadam course shall be prepared to the specified grade and camber and clened of dust, dirt and other extraneous material. Any ruts or soft yielding places shall be corrected in an approved manner and rolled until firm surface is obtained.

2.2.4.2 Where the WMM is to be laid on an existing metalled road, damaged area including depressions and potholes shall be repired and made good with the suitable material. The existing surface shall be scarified and re-shaped to the required grade and camber before spreading the coarse aggregate for WMM.

2.2.4.3 As far as possible, laying WMM course over existing 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 WMM is proposed to be laid over it.

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2.2.4.4 Provision of lateral confinement of aggregates : While constructing wet mix macadam, arrangement shall be made for the lateral confinement of wet mix. This shall be done by laying materials in adjoining shoulders along with that of wet mix macadam layer and following the sequence of operations described in Clause 404.3.3 of MoRT&H Specifications for Road and Bridge Works (Fifth Revision).

2.2.4.5 Preparation of Mix : Wet Mix Macadam shall be prepared in an approved mixing plant of suitable capacity for controlled addition of water and forced/positive mixing arrangement like pugmil or pan type mixer of concrete batching plant. The plant shall have the following features:-

i) For feeding aggregates-three/four bin feeders with variable speed motor.
ii) Vibrating Screen for removal of oversize aggregates.
iii) Conveyor Belt.
iv) Controlled system for addition of water.
v) Forced/positive mixig arrangement like pug-mill or pan type mixer.
vi) Centralised control panel for sequential operatin of various devices and precise process control
vii) Safety devices.

Optimum moisture for mixing shall be determined in accordance with IS : 2720 (part-8) after replacing the aggregate fraction retaine on 22.40 mm sieve with material of 4.75 mm to 22.40 mm size. While adding water, due allowance should be made for evaporation losses. However, at the time of compaction, water in the wet mix should not vary from the optimum velue by more than agreed limits. The mixed material should be uniformily wet and no segregation should be permitted.

2.2.4.6 Spreading of Mix : Immediately after mixing, the aggregates shall be spread uniformly and evenly upon the prepared sub-grade/sub-base/base in required quantities. In no case shall these be dumped in heaps directly on the areas where these are to be laid nor shall their hauling over a partly completed stretch be permitted. The mix be spread by a paver finisher. The paver finisher shall be self-propelled of adequate capacity with following features :

(i) Loading hoppers and suitable distribution system, so as to provide a smooth uninterrupted material flow for different layer thickness from the tipper to the screen

(ii) Hydraulically operated telescopic screed for paving width upto 8.5 m and fixed screed beyond this. The screed shall have tamping and vibrating arrangement for initial compaction to the layer.

(iii) Automatic leveling control system with electronic sensing device to maintain matthickness and cross slope of mat during laying procedure.

2.2.4.7 The surface of the aggregate shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregate as may be required. The layer may be tested by depth blocks during construction. No segregation of larger and fine particles should be allowed. The aggregates as spread should be of uniform gradation with no pockets of fine materials.

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2.2.4.8 Compaction : After the mix has been laid to the required thickness, grade crossfall/camber the same shall be uniformly compacted, to the full depth with suitable roller. If the thickness of single compacted layer does not exceed 100 mm, a smooth wheel roller of 80 to 100 kN weight may be used. For a compacted single layer upto 200 mm, the compaction shall be done with the help of vibratory roller of minimum static weight 80 to 100 kN with an arrangement for adjusting the frequency and amplitude. An appropriate frequency and amplitude may be selected. The speed of the roller shall not exceed 5 Km/h.

2.2.4.9 In portions having unidirectional cross fall/superelevation, rolling shall commence from the lower edge and progress gradually towards the upper edge. Thereafter, roller should progress parallel to the centre line of the road, uniformly over-lapping each preceding track by at least one third width until the entire surface has been rolled. Alternate trips of the roller shall be terminated in stops at least 1 m away from any preceding stop.

2.2.4.10 In portions in camber, rolling should begin at the edge with the roller running forward and backward until the edges have been firmly compacted. The roller shall then progress gradually towards the centre parallel to the centre line of the road uniformly overlapping each of the preceding track by at least one third width until the entire surface has been rolled.

2.2.4.11 Any displacement occurring as a result of reversing of the direction of a roller or from any other cause shall be corrected at once as specified and/or removed and made good.

2.2.4.12 Along forms, kerbs, walls or other places not accessible to the roller, the mixture shall be thoroughly compacted with mechanical tampers or a plate compactor. Skin patching of an area without scarifying the surface to permit proper bonding of the added materials shall not be permitted.

2.2.4.13 Rolling should not be done when the subgrade is soft or yielding or when it causes a wave-like motion in the sub-base/base course or subgrade. If irregularities develop during rolling which exceed 12 mm when tested with a 3 metre straight edge, the surface should be loosened and premixed materials added or removed as required before rolling again so as to achieve a uniform surface conforming to the desired grade and crossfall. In no case shall the use of unmixed materials be permitted to make up the depressions.

2.2.4.14 Rolling shall be continued till the density achieved is at least 98% of the maximum dry density for the materials as determined by the method outlined in IS : 2720 (Part-8).

2.2.4.15 After completion, the surface of any finished layer shall be well-closed, free from movement under compaction equipment or any compaction planes, ridges, cracks and loose materials. All loose, segregated or otherwise defective areas shall be made good to the full thickness of the layer and re-compacted.

2.2.5 Setting and drying : After final compaction of wet mix macadam course, the road shall be allowed to dry for 24 hours.

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2.2.6 Opening to Traffic : No vehicular traffic shall be allowed on the finished wet mix macadam surface. Construction equipment may be allowed with the approval of the Engineer-in-Charge/OC Contract.

2.2.7 Surface Finish and Quality Control of Work:

2.2.8 Surface Evenness : The surface finish of construction shall conform to the requirement of Clause 902 of MoRT&H Specifications for Road & Bridge Works (Fifth Revision)

2.2.9 Quality control : Control on the quality of materials and works shall be exercised by the Engineer-in-Charge/OC Contract in accordance with Section 900 of MoRT&H Specifications for Road & Bridge Works (Fifth Revision).

2.2.10 Rectification of Surface Irregularity : Where the surface irregularity of the wet mix macadam course exceeds the permissible tolerances or where the course is otherwise defective due to subgrade soil getting mixed with the aggregates, the full thickness of the layer shall be scarified over the affected area, re-shaped with added premixed material or removed and replaced with fresh premixed material as applicable and re-compacted in accordance with Clause 406.3 of MoRT&H Specifications for Road & Bridge Works (Fifth Revision). The area treated in the aforesaid manner shall not be less than 5 m long and 2 m wide. In no case shall depressions be filled up with unmixed and upgraded materials or fines.

2.2.11 Arrangement for Traffic : During the period of construction, arrangements for traffic shall be done as per Clause 112 of MoRT&H Specifications for Road & Bridge Works (Fifth Revision).

2.2.12 Rate

2.2.12.1 The contract unit rate for the work shall be payment in full for carrying out the required operations including all components for :-

i) Making arrangement for traffic as per Clause 112 of MoRT&H Specifications for Road & Bridge Works (Fifth Revision) except for initial treatment to verges, shoulders and construction of diversions.

ii) Supplying all materials to be incorporated in the work including, all royalties, fees, rents where necessary and all leads and lifts;

iii) All labour, tools, equipments, and incidentals to complete the work to the specifications.

iv) Carrying out the work in part widths of the road where directed, and

v) Carrying out all tests for quality control.

2.2.13 Measurement for Payment:-

2.2.13.1 The work shall be measured as finished work in position in **"Sqm meter"** as specified in Bill of quantity" of Bid Documents. Suitable arrangement shall be made by the contractor to facilitate measurement by the unit specified.

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2.2.13.2 Contractor shall arrange labour and other tools required for taking the measurements. Contractor shall not be entitled for any extra payment on this account. In case the contractor or his accredited representative fails to report for taking joint measurements at the appointed date and time, as intimated by the Engineer-in-Charge/OC Contract in writing, the measurements shall be taken by the Engineer-in-Charge/OC Contract ex-parte without presence of contractor or his accredited representative and measurement thus taken shall be final and binding on the contractor.

3.5.14 Quality Control Tests and their minimum frequency for Wet Mix Macadam in accordance with Table 900-3 of MoRT&H Specifications for road & bridge works (Fifth Edition)

TABLE 900-3.

S/No	Type of Material	Test	Frequency (Min)
(a)	Wet Mix Macadam	i) Aggregate Impact Value	One test per 1000 m^3 of Aggregate
		ii) Grading of aggregate	One test per 200 m^3
		iii) Combined Flakiness and Elongation Index	One test per 500 m^3 of aggregate
		iv) Atterberg limits of portion of aggregate passing 425 micron sieve	One test per 200 m^3 of aggregate
		v) Density of Compacted Layer	One set of three tests per 1000 m^2

2.3 PRIME COAT OVER GRANULAR BASE

2.3.1 The work shall consists of application of a single coat f low viscosity liquid bituminous material to a porous granular surface preparatory to the superimposition of bituminous treatment or mix.

2.3.2 Choice of primer : The primer shall be cationic bitumen emulsion SS1 grade conforming to IS : 8887 of a type and grade as specified in the contract or as directed by the Engineer-in-Charge/OC Contract.

Type of surface	Rate of Spray (kg/sqm)
WMM	0.750

2.3.3 Weather and Seasonal Limitations : Primer shall not be applied during a dust storm or when the weather is foggy, rainy or windy or when the temperature in the shade is less than 10°C. Surfaces which are to receive emulsions primer should be damp, but no free or standing water shall be present. Surface can be just wet by very light sprinkling of water.

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2.3.4 Equipment : The primer shall be applied by a self-propelled or towed bitumen pressure sprayer equipped for spraying the material uniformly at specified rates and temperatures. Hand spraying shall not be allowed except in small areas, inaccessible to the distributor, or in narrow strips where primer shall be sprayed with a pressure hand sprayer, or as directed by the OC Contract/Engineer In-Charge .

2.3.5 Preparation of road surface : The granular surface to be primed shall be prepared in accordance with Clause 502.4.2 of MoRT&H specifications (Fifth Revision).

2.3.6 Application of Bituminous Primer : The bituminous primer shall be sprayed uniformly at the specified rate. The method for application of the primer 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.

2.3.7 Curing : Curing quality control of work, arrangement for traffic, measurement for payment etc shall be in conformity with Clause 502.4.4 to 502.8 of MoRT&H specifications (Fifth Revision).

2.3.8 Measurement for Payment :

2.3.8.1 The work shall be measured as finished work in position in **"Sqm meter"** as specified in Bill of quantity" of Bid Documents. Suitable arrangement shall be made by the contractor to facilitate measurement by the unit specified.

2.3.8.2 Contractor shall arrange labour and other tools required for taking the measurements. Contractor shall not be entitled for any extra payment on this account. In case the contractor or his accredited representative fails to report for taking joint measurements at the appointed date and time, as intimated by the Engineer-in-Charge/OC Contract in writing, the measurements shall be taken by the Engineer-in-Charge/OC Contract ex-parte without presence of contractor or his accredited representative and measurement thus taken shall be final and binding on the contractor.

2.3.9 Rate : The contract unit rate for prime coat shall be payment in full for carrying out the required operations including full compensation for all components listed in clause 401.7 (i) to (v) of MoRT&H specifications for road and bridge works (Fifth Revision) and as applicable to the works specified in these specifications.

2.3.10 Quality Control Tests and their minimum frequency for Prime Coat in accordance with Table 900-4 of MoRT&H Specifications for road & bridge works (Fifth Edition) .

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TABLE 900-4.

S/No	Type of Material	Test	Frequency (Min)
(a)	Primer Coat	i) Quality of binder	Number of samples per lot and test as per IS: 73, IS: 217 and IS: 8887 as applicable.
		ii) Binder temperature for application	At regular close intervals
		iii) Rate of spread of Binder	Three tests per day.

2.4 TACK COAT

2.4.1 The work shall consists of the application of a single coat of low viscosity liquid bituminous materil to existing bituminous or primed granular surface preparatory to the superimposition of a bituminous mix when specified in the contract or as instructed by the OC Contract/Engineer-in-Charge.

2.4.2 Binder : The binder used for tack coat shall be bitumen VG-30. The type and grade of binder for tack coat shall be specified in the Contract or as directed by the OC Contract/Engineer-in-Charge.

2.4.3 Equipment : The tack coat shall be applied by a self-propelled or towed bitumen pressure sprayer, equipped for spraying the material uniformly at a specified rate. Hand spraying shall not be permitted except in small areas, inaccessible to the distributor, or narrow strips, shall be sprayed with a pressure hand sprayer, or as directed by the OC Contract/Engineer-in-Charge.

2.4.4 Preparation of Base : The surface on which the tack coat is to be applied shall be clean and free from dust, dirt, and any extraneous material, and be otherwise prepared in accordance with the requirements of Clause 501.8 of MoRT&H specifications (Fifth revision). The granular or stabilized surfaces shall be primed as per Clause 502 of MoRT&H specifications (Fifth revision). 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 .

2.4.5 Application of Tack Coat : The application of tack coat shall be at the rate specified in the Contract, and shall be applied uniformly in accordance with Clause 503.4.3 of MoRT&H specifications (Fifth Revision). Curing, quality control, arrangement of traffic and measurement for payment shall be in accordance with Clause 503 of MoRT&H specifications. Rate of application of tack coat as per Table 500-5 of MoRT&H specifications is as under :-

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Type of surface	Rate of Spray of Binder in kg/Sqm
Bituminous surface	0.25
Granular surface treated with primer	0.25

2.4.7 Measurement for payment : Tack coat shall be measured in terms of surface area of application in square metres.

2.4.8 Rate : The contract unit rate for prime coat shall be payment in full for carrying out the required operations including full compensation for all components listed in clause 401.8 (i) to (v) of MoRT&H specifications for road and bridge works (Fifth Revision) and as applicable to the works specified in these specifications.

2.4.9 Quality Control Tests and their minimum frequency for Tack Coat in accordance with Table 900-4 of MoRT&H Specifications for road & bridge works (Fifth Edition)

TABLE 900 - 4

S/No	Type of Material	Test	Frequency (Min)
(a)	Tack Coat	i) Quality of binder	Number of samples per lot and test as per IS: 73, IS: 217 and IS: 8887 as applicable.
		ii) Binder temperature for application	At regular close intervals
		iii) Rate of spread of Binder	Three tests per day.

2.5 DENSE BITUMINOUS MACADAM CONSOLIDATED THICKNESS

2.5.1 Scope of Work The work consists of providing, laying, spreading and compaction of Dense Bituminous Macadam compacted thickness with HMP mix, including cleaning of road surface (bituminous and non bituminous), applying of primer and tack coat, laying by paver finisher and rolling to specified thickness for surfacing works as directed by Engineer-In-Charge/OC Contract as per clause 505 of MoRT&H Specifications for Road and Bridge Works-Fifth Revision.

2.5.2 Material

2.5.2.1.Bitumen The bitumen shall be viscosity graded paving bitumen complying with Indian Standard Specification, IS:73, modified bitumen complying with Clause 501.2.1 of MoRT&H Specifications for road and bridge works (Fifth Revision) or as otherwise specified in the contract.

2.5.2.2 Coarse Aggregates

The coarse aggregate shall consist of crushed rock crushed gravel or other hard material retained on 2.36 mm sieve. It shall be clean, hard, durable and cubical shape, free from dust and soft organic and other deleterious substnces. Ehere the contractor's selected

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source of aggregates has poor affinity to bitumen, the contractor shall produce test results that with the use of anti stripping agent, the stripping value is improved to satisfy the specification requirements. The Engineer-in-Charge/OC Contract may approve such a source and as a condition for the approval of the source, the bitumen shall be treated with an approved anti stripping agent, as per the manufacturers recommendations, at the cost of the contractor. The aggregate shall satisfy the requirements specified in Table 500-8 of MoRT&H Specifications for road and bridge works (Fifth Revision).

Where crushed gravel is proposed for use as aggregate, not less than 90 % by weight of the crushed material retained on the 4.75 mm sieve shall have at least two fractured faces.

2.5.2.3 Fine Aggregate

Fine aggregate shall consist of crushed or naturally occurring mineral material, or a combination of two, passing 2.36 mm sieve and retained on 75 micron sieve. It shall be clean, hard, durable, dry and free from dust, and soft organic and other deleterious substances. Natural sand shall not be used in the binder course.

2.5.2.4 Filler

Filler shall consist of finely divided mineral matter such as rock dust, hydrated lime or cement approved by the Engineer In-Chrge/OC Contract. The filler shall be graded within the limits indicated in Table 500-9 of MoRT&H Specifications for road and bridge works (Fifth Revision).

TABLE 500 - 9

IS Sieve (mm)	Cumulative %age passing by weight of total aggregate
0.60	100%
0.30	90 – 100%
0.075	85 – 100%

The filler shall be free from organic impurities and have a plasticity index not greater than 4. The Plasticity Index requirement shall not apply if filler is cement or lime. Where the aggregates fail to meet the requirements of the water sensitivity test in Table 500-8 of MoRT&H Specifications for road and bridge works (Fifth Revision), then 2 percent by total weight of aggregate, of hydrated lime shall be used and percentage of fine aggregate reduced accordingly.

2.5.3 Aggregate Grading and Binder Content

2.5.3.1 The combined grading of the coarse aggregates and fine aggregates and filler when tested in accordance with IS-2386 Part I (Wet sieving method) the combined aggregate grading for the particular mixture shall fall within the limit as per table 500-10 (MoRT&H Specifications, Fifth revision) shown as under for grading 2. To avoid gap grading, the combined aggregate gradation shall not vary from the lower limit on one sieve to higher limit on the adjacent sieve.

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Table 500-10: Composition of Dense Graded Bituminous Macadam

Grading	**2**
Nominal Aggregate Size *	**26.50 mm**
Layer Thickness	50-75 mm
IS Sieve Designation	Percentage by weight passing
37.50	100
26.50 mm	90-100
19 mm	71-95
13.2 mm	56-80
4.75 mm	38-54
2.36	28-42
0.3 mm	7-21
0.075 mm	2-8
Bitumen content, percent by weight of total mixture – Min 4.5 % **	

Notes:-

(*) Nominal maximum particl size id the largest specified sieve size upon which any of the aggregate is retained.

(**) Bitumen Content corresponds to specific gravity of the Aggregate being 2.7. In case aggregates have specific gravity more than 2.7, the minimum bitumen content can be reduced proportionately. Further, for regions where highest daily mean air temperature is 30°C or lower and lowest daily mean air temperature is (-) 10°C or lower, the bitumen content may be increased by 0.50 percent subject to the approval of OC Contract/Engineer-in-Charge/OC Contract-In-Charge.

2.5.3.2 Bitumen content indicated in Table 500-10 is the minimum quantity. The quantity shall be determined in accordance with Clause 505.3 of MoRT&H specifications for road & bridge works (Fifth revision).

2.5.3.3 The aggregate for Dense Bituminous Macadam shall satisfy the physical requirement set forth as per table No 500-8 (MoRT&H specifications, Fifth revision) as under:-

Property	Test	Test method	Requirements
Cleanliness	Grain size analysis	IS : 2386 Part I	Max 5% passing 0.075 mm sieve
Particle shape	Flakiness and Elongation Index (Combined)	IS : 2386 Part I	Max 35%
Strength (*)	Los Angels Abrasion value	IS : 2386 Part IV	Max 35%
	Aggregate Impact Value	IS : 2386 Part IV	Max 27%

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Property	Test	Test method	Requirements
Durability	Soundness		
	(a) Sodium Sulphate	IS : 2386 Part V	Max 12%
	(b) Magnesium Sulphate	IS : 2386 Part V	Max 18%
Water absorption	Water absorption	IS : 2386 Part III	Max 2%
Stripping	Coating and Stripping of bitumen aggregate	IS : 6241	Minimum retained coating 95%
Water Sensitivity (**)	Retained Tensile strength	AASHTO 283	Min 80%

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

(**) If the minimum retained tensile strength falls below 80 percent, use of antistripping agent is recommended to meet the minimum requirement.

2.5.4 Anti Stripping Agent

Where the proposed aggregate fails to pass the stripping test, then an approved anti stripping agent (Appendix 4 of MoRT&H specifications for road and bridge works (fifth revision) for details) may be added to the binder in accordance with the manufacturer's instructions. The effectiveness of the proposed anti-stripping agent must be demonstrated by the Contractor, before approval by the Engineer-in-Charge/OC Contract-in-Charge.

2.5.5 Warm Mix Additives

An approved Warm Mix Additives may be used for the work as per the provisions of IRC:SP:101-2014 and as per the directions of Engineer-in-Charge/OC Contract-in-Charge. Mixing, Laying and Rolling temperature for WMA will be as per Table 1 of IRC:SP:101-2014 as under :-

Bitumen Grade	Mix Temperature (°C)	Laying Temperature (°C)	Rolling Temperature (°C)
VG-30	130 max	115 min	90 min
VG-10	120 max	110 min	80 min

In case of special conditions including but not limited to long hauls, cold paving conditions etc. the recommendations of the WMA technology supplier shall be followed.

2.5.6 Mix Design

The bitumen content required shall be determined following the Marshall mix design procedure contained in BituminousInstitute Manual MS-2. The fines to Bitumen (F/B) ratio by weight of total mix shall range from 0.60 to 1.20.

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2.5.7 Requirements for the Mix

Apart from conformity with the grading and quality requirements for individual ingredients, the mixture shall meet the requirements set out in Table 500-11 of MoRT&H specifications for road & bridge works (Fifth Revision) as under :-

Properties	Viscocity Grade Paving bitumen	Modified Bitumen		Test Method
		Hot Climate	Cold Climate	
Compction Level	75 Blows on each face of the specimen			
Minimum Stability (kN at 600 C)	9.0	12.0	10.0	AASHTO T245
Marshall flow 9mm)	2-4	2.5-4	3.5-5	AASHTO T245
Mrshall Quotient (Stability/Flow)	2-5	2.5-5		MS-2 and ASTM D2041
% air voids	3-5			
% voids Filled with Bitumen (VFB)	65-75			
Coating of Aggregate Particle	95% minimum			
Tensile Strength ratio	80% minimum			
% Voids in Mineral aggregate (VMA)	Minimum percent voids in mineral aggregate (VMA) are set out in Table 500-13			

2.5.8 Binder Content

2.5.8.1 The binder content shall be optimized to achieve the requirements of the mix set out I Table 500-11 of MoRT&H Specifications for road and bridge works (Fifth Revision). The binder content shall be selected to obtain 4 percent air voids in the mix design. The Marshall method for determining the optimum binder content shall be adopted as described in the BituminousInstitute Manual MS-2.

2.5.8.2 Where maximum size of the aggregate is more than 26.5 mm, the modified MarshII method using 150 mm diameter specimen described in MS-2 and ASTM D 5581 shall be used. This method requires modified equipment and procedures. When the modified Marshall test is used, the specified minimum stability values in Table 500-12 of MoRT&H Specifications for road and bridge works (Fifth Revision) shall be multiplied by 2.25 and the minimum flow shall be 3 mm.

Nominal Maximum Particle Size (mm)	Minimum VMA Percent Related to Design Percentage Air Voids		
	3.0	4.0	5.0
26.50	11.0	12.0	13.0
37.50	10.0	11.0	12.0

Note : Interpolate minimumvoids in the mineral aggregate (VMA) for designed percentage air voids values between those listed.

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2.5.9 Job Mx Formula

2.5.9.1 The contractor shall submit to the Engineer-in-Charge/OC Contract for approval at least 21 days before the start of the work, the job mix formula proposed for use in the works, together with the following details:

(i) Source and location of all materials.

(ii) Proportions of all materials expressed as follows:-

(a) Binder type and percentage by weight of total mix.

(b) Coarse aggregate/fine aggregate/mineral filler as percentage by weight of total aggregate including mineral filler.

(iii) A single definite percentage pasing each sieve for the mixed aggregate.

(iv) The individual gradings of the individual aggregate fraction and the proportion of each in the combined grading.

(v) The results of mix desgn such as maximum specific gravity of loose mix (Gmm), compacted specimen densities, Marshall stability flow, flow air voids, VMA, VFB and related graphs and test results of AASHTO T 283 Moisture susceptibility test.

(vi) Where the mixer is a batch mixer, the individual weights of each type of aggregate and binder per batch.

(vii) Test results of physical characteristics of aggregates to be used.

(viii) Mixing temperature and compacting temperature.

2.5.9.2 While establishing the job mix formula, the contractor shall ensure that it is based on a correct and truly representative sample of the materials that will actually be used in the work and that the mix and its different ingredients satisy the physical and strength requirements of these specifications.

2.5.9.3 Approval of the job mix formula shall be based on independent testing by the Engineer-in-Charge/OC Contract for which samples of all ingredients of the mix shall be furnished by the contractor as required by the Engineer-in-Charge/OC Contract.

2.5.9.4 The approved job mix formula shall remain effective unless and until a revised job mix formula is approved by OC Contract/Commander Contract. Should a change in the source of materials be proposed, a new job mix formula shall be forwarded by the contractor to the Engineer-in-Charge/OC Contract for approval before the placing of the material.

2.5.10 Permissible Variation in Job Mix Formula

Once the laboratory job mix formula is approved, the Contractor shall carry out plant trial to establish that the plant can produce a uniform mix conforming to the approved job mix formula. The permissible variation of the individual percentage of the various ingredients in the actual mix from the job mix formula to be used shall be within the limits as specified in Table 500-13 and shall remain within the gradation band. These variations are intended to apply to individual specimens taken for quality control tests in accordance with section 900 of MoRT&H Specifications for road and bridge works (Fifth Revision).

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Table 500-13 Permissible Variations in the Actual Mix from the Job Mix Formula

Aggregate passing 19 mm sieve or larger	±8%
Aggregate passing 13.2 mm, 9.50 mm	±7%
Aggregate passing 4.75 mm	±6%
Aggregate passing 2.36 mm, 1.18 mm, 0.60 mm	±5%
Aggregate passing 0.30 mm, 0.15 mm	±4%
Aggregate passing 0.075 mm	±2%
Binder content	±0.30%
Mixing temperature	±10°C

2.5.11 Laying

2.5.11.1 Once the plant trials have been successfully completed and approved, the Contractor shall carry out laying trials, to demonstrate that the proposed mix can be successfully laid and compacted all in accordance with Clause 501 of MoRT&H Specifications for road and bridge works (Fifth Revision). The laying trial shall be carried out on a suitable area which is not form part of the works. The area of the laying trials shall be a minimum of 100 sqm of construction similar to that of the project road, and it shall be in all respects, particularly compaction, the same as the project construction, on which the bituminous material is to be laid.

2.5.11.2 The contractor shall previously inform the Engineer-in-Charge/OC Contract of the proposed method for laying and compacting the material. The plant trials shall then establish if the proposed laying plant, compaction plant, and methodology is capable of producing satisfactory results. The density of the finished paving layer shall be determined by taking cores, no sooner than 24 hours after laying, or by other approved method. The compacted layer of Dense Graded Bituminous Macadam (DBM) shall have a minimum field density equal to or more than 92% of the density based on theoretical maximum specific gravity (Gmm) obtained on the day of compaction in accordance with ASTM D 2041.

2.5.11.3 Once the laying trials have been approved, the same plant and methodology shall be applied to the laying of the material on the project, and no variation of either shall be acceptable, unless approved in writing by the Engineer-in-Charge/OC Contract, who may at his discretion require further laying trials.

2.5.12 Construction Operations

2.5.12.1 Weather and Seasonal Limitations Laying shall be suspended:-

(a) In presence of standing water on the surface.

(b) When rain is imminent, and during rains, fog or dust storm.

(c) When the base/binder course is damp.

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(d) When the air temperature on the surface on which it is to be laid is less than 10°C for mixes with conventional bitumen and is less than 15°C for mixes with modified bitumen.

(e) When the wind speed at any temperature exceeds the 40 km per hour at 2 m height.

2.5.13 Preparation of the Base

The base on which Dense Graded Bituminous Material is to be laid shall be prepared in accordance with Clause 501 and 902 of MoRT&H Specifications for road and bridge works (Fifth Revision) as appropriate, or as directed by the Engineer-in-Charge/OC Contract-in-Charge.

2.5.14 Prime Coat

Where the material on which the Dense Bituminous Macadam is to be laid is other than a bitumen bound layer, a prime coat shall be applied @ 0.75 kg/sqm, as specified in accordance with the provisions of Clause 502 of MoRT&H Specifications for road and bridge works (Fifth Revision) or as directed by the Engineer-in-Charge/OC Contract.

2.5.15 Tack Coat

Where the material on which the Dense Bituminous Macadam is to be laid is either bitumen bound layer or primed granular layer, tack coat shall be applied @ 0.25kg/sqm, as specified in accordance with the provisions of Clause 503 of MoRT&H Specifications for road and bridge works (Fifth Revision) or as directed by the Engineer-in-Charge/OC Contract.

2.5.16 Blank

2.5.17 Mixing and Transportation of the Mix

The provisions as specified in Clauses 501.3 and 501.4 of MoRT&H specifications for road and bridge works (Fifth Revision) shall apply

Mixing

2.5.17.1 Pre-mixed bituminous materials shall be prepared in a Hot Mix Plant of adequate capacity and capable of yielding a mix of proper and uniform quality with thoroughly coated aggregates. Appropriate mixing temperature are given as under as per Table 500-2 :-

Bitumen Viscosity Grade	Bitumen Temperature	Aggregate Temperature	Mixed Material Temperature	Laying Temperature	* Rolling Temperature
VG-30	150-165	150-170	150-165	140 Min	90 Min
VG-10	140-160	140-165	140-160	130 Min	80 Min

- Rolling must be completed before the material cools to these minimum temperatures.

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2.5.17.2 The difference in temperature between the binder and aggregate shall at no time exceed 14°C. In order to ensure uniform quality of the mix and better coating of aggregates, the hot mix plant shall be caliberated from time to time. The essential features of the mix plants are given in Annexure A of IRC:27. If a continuous type mixing plant is used, the contractor must demonstrate by laboratory analysis that the cold feed combined grading is within the grading limits specified for that bituminous bond material. In case of a designed job mix, the bitumen and filler content shall be derived using this combined grading.

2.5.18 Transportation Bituminous materials shall be transported in clean insulated and covered vehicles. An Bituminousrelease agent, such as sop or lime water, may be applied to the interior of the vehicle to prevent sticking and to facilitate discharge of the material.

2.5.19 Spreading

2.5.19.1 Prior to spreading the mix, the base shall be prepared by carrying out the required operations as per Clause 501.8 depending upon the site conditions. Except in areas where paver cannot get access, bituminous materials shall be spread, leveled and tamped by an approved self propelled paving machine equipped with an electronic sensing device. The essential features of the paver finisher shall conform to Annexure A of IRC:27. 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 the 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 material across the screed, free from dragging, tearing and segregation of the material. In areas with restricted space (such as confined space, foot ways, of irregular shape and varying thickness, approaches to expansion joints etc) where paver cannot be used, the material shall be spread, raked and leveled with suitable hand tools trained staff.

2.5.19.2 The minimum thickness of the material laid in each paver pass shall be in accordance with the minimum values given in the relevant parts of these specifications. When laying binder course or wearing course approaching an expansion joint of a bridge, machine laying shall stop 300 mm short of the joints. The reminder of the pavement up to the joint, and the corresponding area beyond it, shall be laid by hand, and the joint or joint cavity shall be kept clear of surfacing material.

2.5.19.3 . Bituminous material with a temperature greater than 145°C shall not be laid or deposited on bridge deck water-proofing systems, unless precautions against heat damage have been approved by the .

2.5.20 Rolling

The General Provisions of Clauses 501.6 and 501.7 of MoRT&H specifications for road and bridge works (Fifth Revision) shall apply :-

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Compaction

2.5.20.1 Bituminous materials shall be laid and compacted in layers, which enable the specified thickness, surface level, regularity requirements and compaction to be achieved.

2.5.20.2 Compaction of bituminous materials shall commence as soon as possible after laying. Compaction shall be substantially completed before the temperature falls below the minimum specified in para 29.9.7.1 above. Rolling of the longitudinal joints shall be done immediately behind the paving operation. After this, rolling shall commence at the edges and progress towards the center longitudinally, except that on super-elevated and inidirectionally cambered portions, it shall progress from the lower to the upper edge parallel to the centerline of the pavement. Rolling shall continue until all roller marks have been removed from the surface. All deficiencies in the surface after laying shall be made good by the attendants behind the paver, before initial rolling is commenced. The initial or break down rolling shall be done with 8–10 tones static weight smooth wheeled rollers. The intermediate rolling shall be done with 8–10 Tones static weight or vibratory roller or with a pneumatic tyre roller of 12–15 tones weight with a tyre pressure of 0.56 Mpa. The contractor shall demonstrate the efficiency of the equipment proposed to be used by carrying compaction trials. The procedure for site trials shall be submitted to the for approval. The finish rolling shall be done with 6–8 tone smooth wheeled tandem rollers. Rolling shal continue until the specified compaction is achieved.

2.5.20.3 Where compaction is to be determined by density of cores the requirement to prove the performance of rollers shall apply in order to demonstrate that the specified density can be achieved. In such cases the contractor shall specify the plant, and the method by which he intends to achieve the specified level of compaction and finish at temperatures above the minimum specified rolling temperature. Laying trials shall then demonstrate the acceptability of the plant and method used. Bituminous materials shall be rolled in a longitudinal direction with the driven rolls nearest the paver. The roller shall first compact material adjacent to joints and then work from the lower to the upper side of the layer, overlapping on successive passes by at least one third of the width of the rear roll or, in the case of a pneumatic tyred roller, at least the nominal width of 300 mm.

2.5.20.4 In portions with super elevated and uni-directional camber, after the edge has been rolled, the roller shall progress from the lower to the upper edge. Rollers should move at a speed of not more than 5 Km per hour. The roller shall not be permitted to stand on pavement which has not been fully compacted, and necessary precautions shall be taken to prevent dropping of oil, grease, petrol/diesel or other foreign matter on the pavement either when the rollers are operating or standing. The wheels of rollers shall be in good working ordr, to prevent the mix from adhering to the wheels. Only sufficient moisture to prevent adhesion between the wheels of rollers and the mix should be used. Surplus water shall not be allowed to stand on the partially compacted pavement.

2.5.21 Joints Where joints are made, the materials shall be fully compacted and the joints made flush in one of the following ways :-

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2.5.21.1 All joints shall be cut vertical to the full thickness of the previously laid mix. All loosened material shall be discarded and the vertical face coated with a suitable viscosity grade hot bitumen, or cold applied emulsified bitumen. While spreading the material along the joint, the material spread shall overlap 25 mm to 50 mm on the previously laid mix beyond the vertical face of the joint. The thickness of the loose overlap material should be approximately a quarter more than the final compacted thickness. The overlapped mix shall be dragged back to the hot lane so that the roller can press the small excess into the hot side of the joint to obtain a high joint density.

2.5.21.2 By using two or more pavers operating in echelon, where this is practicable and in sufficient proximity for adjacent widths to be fully compacted by continuous rolling.

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

2.5.21.4 For transverse joints method (i) above shall apply. Transverse joints in the successive and adjoining layers have a minimum offset of 2 m.

2.5.22 Opening to Traffic

2.5.22.1 It shall be ensured that the traffic is not allowed without the approval of the Engineer-in-Charge/OC Contract in writing, on the surface until the dense bituminous layer has cooled to the ambient temperature.

2.5.23 Surface Finish and Quality Control of Work

The surface finish of the completed construction shall conform to the requirement of Clause 902 of MoRT&H Specifications (Fifth Revision). For Control of the quality of materials and the works carried out, the relevant provisons of section 900 shall apply.

2.5.24 Arrangement For Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

2.5.25 Measurement for Payment.

Dense Graded Bituminous Macadam shall be measured as finished work in **square meters for compacted thickness** by any standard means to be decided by the Engineer-in-Charge/OC Contract.

2.5.26 RATE

The contract unit rate of Dense Graded Bituminous Macadam shall be payment in full for carrying out all the required operations as specified and shall include, to all components listed in Clause 501.8.8.2 of MoRT&H Specifications for road and bridge works (Fifth Revision). The rate shall include the provision of bitumen at 4.5 percent by weight of the total mixture for grading 2.

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2.5.27 Quality Control Tests and their minimum frequency for DBM in accordance with Table 900-4 of MoRT&H Specifications for road & bridge works (Fifth Edition)

TABLE 900-4.

S/No	Type of Material	Test	Frequency (Min)
(a)	Dense Bituminous Macadam	i) Quality of binder	Number of samples per lot and tests as per IS:73 or IRC:SP:53, IS:15462
		ii) Aggregate Impact Value/Los Angeles Abrasion Value	One test per 350 cum of aggregate for each source and whenever there is change in the quality of aggregate.
		iii) Flakiness Index and Elongation Index	One test per 350 cum of aggregate for each source and whenever there is change in the quality of aggregate.
		iv) Soundness (Magnesium and Sodium Sulphate)	One test for each source and whenever there is change in the quality of aggregate.
		v) Water absorption of aggregates	-do-
		vi) Sand equivalent test	-do-
	Dense Bituminous Macadam	vii) Plasticity Index	-do-
		viii) Polished stone value	-do-
		ix) Percentage of fractured faces	One test per 350 cum of aggregate when crushed gravel is used.
		x) Mix Grading	One test for individual constituent and mixed aggregate from dryer for each 400 tonnes of mix subject to minimum of two tests per day per plant
		xi) Stability and voids analysis of mix including theoretical maximum specific of loose mix	Three tests for stability, flow value, density and void contents for each 400 tonnes of mix subject to minimum of two tests per day per plant
		xii) Moisture Susceptibility of mix (AASHTO T283)	One test for each mix type whenever there is change in the quality of source of coarse or fine aggregate.

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S/No	Type of Material	Test	Frequency (Min)
		xiii) Temperature of binder in boiler, aggregate in dryer and mix at the time of laying and compaction	At regular intervals
		xiv) Binder Content	One set for each 400 tonnes of mix subject to minimum of two tests per day per plant
		xv) Rate of spread of mix materials	After every 5th truck load
		xvi) Density of compacted layer	One test per 700 sqm area.

2.6. BITUMINOUS CONCRETE COMPACTED THICKNESS

2.6.1 SCOPE : The work consists of providing; laying, spreading and compaction of Bituminous Concrete compacted including rolling to required density, cleaning & scrubbing of previous base course, laying of Tack Coat in accordance with the requirements of specifications as given in succeeding Paras. The work also includes preparation of Mix in HMP of adequate capacity to be established by the contractor and transportation of Mix to the laying site duly spread by pavers, and compacted to the specified thickness for surfacing works as directed by Engineer-In-Charge/OC Contract. The work to be executed as per clause 507 of MoRT&H Specifications for Road and Bridge Works-Fifth Revision.

2.6.2 Materials

2.6.1 Bitumen The bitumen shall be viscosity graded paving bitumen complying with Indian Standard Specification, IS:73, modified bitumen complying with Clause 501.2.1 of MoRT&H Specifications for road and bridge works (Fifth Revision) or as otherwise specified in the contract.

2.6.2 Coarse Aggregates The Coarse aggregates shall consist of crushed rock or other hard material retained on 2.36 mm sieve. It shall be clean, hard, durable and cubical in shape, free from dust and soft organic and other deleterious substances. The aggregate shall satisfy the physical requirements specified in table No 500-16. Before approval of the source, the aggregates shall be tested for stripping. Where the Contractor's selected source of aggregates have poor affinity for bitumen, as a condition for the approval of that source, the bitumen shall be treated with approved anti-stripping agents, as per the manufacturer's recommendations, without additional payment.

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Table 500-16: Physical Requirement for Coarse Aggregate for Bituminous Concrete

Property	Test	Specification	Method of Test
Cleanliness (dust)	Grain size analysis	Max 5% passing 0.075 mm sieve	IS : 2386 Part I
Particle shape	Flakiness and Elongation Index (Combined)	Max 35%	IS : 2386 Part I
Strength	Los Angels Abrasion value	Max 30%	IS : 2386 Part IV
	Aggregate Impact Value	Max 24%	
Durability	Soundness		
	(a) Sodium Sulphate	Max 12%	IS : 2386 Part V
	(b) Magnesium Sulphate	Max 18%	IS : 2386 Part V
Polishing	Polished Stone Value	Min 55	BS:812-114
Water absorption	Water absorption	Max 2%	IS : 2386 Part III
Stripping	Coating and Stripping of Bitumen Aggregate Mix	Minimum retained coating 95%	IS : 6241
Water Sensitivity	Retained Tensile strength *	Min 80%	AASHTO 283

- If the minimum retained tensile test strength falls below 80 percent, use of Anti Stripping Agent is recommended to meet the requirement.

2.6.3 Fine Aggregate

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

2.6.4 Filler

Filter shall consist of finely divided mineral matter such as rock dust, hydrated lime or cement approved by the Engineer-in Charge/OC Contract. The filler shall be graded within the limits shown in table No 500-9 of MoRT&H specifications (Fifth Revision) as under:-

IS Sieve (mm)	Cumulative per cent passing by weight of total aggregate
0.6	100
0.3	95-100
0.075	85-100

The filler shall be free from organic impurities and have a Plasticity Index not greater than 4. The plasticity index requirement shall not apply if filter is cement or lime. When the aggregates fail to meet the requirements of the water sensitivity test in Table 500-8 of MoRT&H specifications for road and bridge works (Fifth Revision), then 2 percent by total weight of aggregate of hydrated lime shall be used and percentage of fine aggregate reduced accordingly.

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2.6.5 Aggregate Grading and Binder Content

When tested in accordance with IS:2386 Part 1 (Wet grading method), the combined grading of the coarse and fine aggregates and filler shall fall within the limits shown in Table 500-17.

Grading	**2**
Nominal Aggregate size*	**13.2 mm**
Layer thickness	**30 mm**
IS Sieve Designation	**Percentage by weight passing**
19 mm	100
13.2 mm	90-100
9.50 mm	70-88
4.75 mm	53-71
2.36 mm	42-58
1.18 mm	34-48
0.6 mm	26-38
0.3 mm	18-28
0.15 mm	12-20
0.075 mm	4-10
Bitumen content, percent by mass of total mix – Min 5.4 % *	

- Corresponds to specific gravity of aggregate being 2.7. In case aggregate have specific gravity more than 2.7, the minimum bitumen content can be reduced proportionately. Further the region where highest daily mean air temperature is 30°C or lower and lowest daily air temperature is - 10°C or lower, the bitumen content may be increased by 0.50 percent.

2.6.6 Anti Stripping Agent

Where the proposed aggregate fails to pass the stripping test, then an approved anti stripping agent (Appendix 4 of MoRT&H specifications for road and bridge works (fifth revision) for details) may be added to the binder in accordance with the manufacturer's instructions. The effectiveness of the proposed anti-stripping agent must be demonstrated by the Contractor, before approval by the Engineer-in-Charge/OC Contract-in-Charge.

2.7. Mix Design

2.7.1 Requirement For The Mix : Apart from conformity with the grading and quality requirements for individual ingredients, the mixture shall meet the requirements set out in Table 500-11 of MoRT&H Specifications Fifth revision as under.

Properties	**Viscosity Grade Paving bitumen**	**Modified Bitumen**		**Test Method**
		Hot Climate	**Cold Climate**	
Compaction Level	75 Blows on each face of the specimen			
Minimum Stability (kN at 600 C)	9.0	12.0	10.0	AASHTO T245
Marshall flow (mm)	2-4	2.5-4	3.5-5	AASHTO T245

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Properties	Viscosity Grade Paving bitumen	Modified Bitumen Hot Climate/ Cold Climate	Test Method
Marshall Quotient (Stability/Flow)	2-5	2.5-5	MS-2 and ASTM D2041
% air voids	3-5		
% voids Filled with Bitumen (VFB)	65-75		
Coating of Aggregate Particle	95% minimum		
Tensile Strength ratio	80% minimum		
% Voids in Mineral aggregate (VMA)	Minimum percent voids in mineral aggregate (VMA) are set out in Table 500-13		

2.7.2 Binder Content

The binder content shall be optimized to achieve the requirements of the mix set out in Table 500-11 of MoRT&H Specifications (Fifth revision). The binder content shall be selected to obtain 4 percent air voids in the mix design. The Marshall method for determining the optimum binder content shall be adopted as described in the Asphalt Institute Manual MS-2.

Where maximum size of the aggregate is more than 26.50 mm, the modified marshal method using 150 mm diameter specimen described in MS-2 and ASTM D 5581 shall be used. This method requires modified equipment and procedures. When the modified Marshall test is used, the specified minimum stability values in Table 500-12 shall be multiplied by 2.25 and the minimum flow shall be 3 mm.

Nominal Maximum Particle Size (mm) *	Minimum VMA Percent Related to Design Percentage Air Voids		
	3.0	4.0	5.0
26.50	11.0	12.0	13.0
37.50	10.0	11.0	12.0

Note: Interpolate minimum voids in the mineral aggregate (VMA) for designed percentage air voids values between those listed.

2.7.3 Job Mix Formula

This shall be as per Clause 507.3.3 of MoRT&H Specifications (Fifth Revision). The contractor shall submit to the Engineer-in-Charge/OC Contract for approval at least 21 days before the start of the work of the job mix formula proposed for use in the work together with the following details :-

(i) Source and location of all materials.

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(ii) Proportions of all materials expressed as follows:-

(a) Binder type, and percentage by weight of total mixture.

(b) Coarse aggregate/fine aggregate/mineral filler as percentage by weight of total aggregate including mineral filler.

(iii) A single definite percentage passing each sieve for the mixed aggregate.

(iv) The individual grading of the individual aggregate fraction, and the proportions of each in the combined grading.

(v) The results of mix deign such as maximum specific gravity of loose mix (Gmm), compacted specimen densities, Marshall stability, flow, air voids, VMA, VFB and related graphs and test results of AASHTO T 283 Moisture susceptibility test.

(vi) Where the mixture is a batch mixture, the individual weights of each type of aggregate, and binder per batch.

(vii) Test results of physical characteristics of aggregate to be used.

(viii) Mixing temperature and compacting temperature.

While establishing the job mix formula, the contractor shall ensure that it is based on a correct and truly representative samples of the material that will actually be used in the work and that the mixture and its different ingredients satisfy the physical and strength requirement of these specifications.

Approval of the Job Mix Formula shall be based on independent testing by the Engineer-in-Charge/OC Contract for which samples of all ingredients of the mix shall be furnished by the Contractor as required by the Engineer-in-Charge/OC Contract.

The approval of the job mix formula shall remain effective unless and until a revised job mix formula is approved. Should a change in the source of materials be proposed, a new job mix formula shall be forwarded by the contractor to the Engineer-in-Charge/OC Contract for approval before the placing of the material.

2.7.4 Plant Trials-Permissible Variation in Job Mix Formula

Once the laboratory job mix formula is approved, the Contractor shall carry out plant trials to establish that the plant can produce a uniform mix conforming to the approved job mix formula. The permissible variations of the individual percentages of the various ingredients in the actual mix from the job mix formula to be used shall be within the limits as specified in Table 500-18 and shall remain within the gradation band. These variations are intended to apply to individual specimens taken for quality control tests in accordance with Section 900 of MoRT&H specifications Fifth revision.

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Table 500-18: Permissible Variations in Plant Mix from the Job Mix Formula

Description	Parmissible Variation
Aggregate Passing 19 mm sieve or larger	+/- 7%
Aggregate Passing 13.2 mm,9.5 mm	+/- 6%
Aggregate Passing 4.75 mm	+/- 5%
Aggregate Passing 2.36 mm,1.18mm,0.60mm	+/- 4%
Aggregate Passing 0.30mm, 0.15 mm	+/- 3%
Aggregate Passing 0.075 mm	+/- 1.5%
Binder Content	+/- 0.3%
Mixing Temperature	+/- 10°C

2.7.5 Laying Trials

Once the plant trials have been successfully completed and approved, the contractor shall carry out laying trials, to demonstrate that the proposed mix can be successfully laid, and compacted all in accordance with Clause 501 of MoRT&H Specifications (Fifth Revision). The laying trial shall be carried out on a suitable area which is not to form part of the works. The area of laying trials shall be a minimum of 100 sqm of construction similar to that of the project road, and it shall be in all respects, particularly compaction, the same as the project construction, on which the bituminous material is to be laid.

The contractor shall previously inform the Engineer-in-Charge/OC Contract of the proposed method for laying and compacting the material. The plant trials shall then establish if the proposed laying plant, compaction plant, and methodology is capable of producing satisfactory results. The density of the finished paving layer shall be determined by taking cores no sooner than 24 hrs after laying or by other approved method. The compacted layers of Asphaltic Concrete (AC) shall have a minimum field density equal to more than 92% of the average theoretical maximum specific gravity (g/mm) obtained on the day of compaction in accordance with ASTM D 2041.

Once the laying trials have been approved, the same plants and methodology shall be applied to the laying of the material on the project, and no variation of either shall be acceptable, unless approved in writing by the Engineer-in-Charge/OC Contract who may at his discretion require further laying trials.

2.8 Construction Operation

2.8.1 Weather and Seasonal Limitations. Laying shall be suspended:-

(i) In presence of standing water on the surface.
(ii) When rain is imminent and during rains, fog or dust storm.
(iii) When the base/binder course is damp.
(iv) When the air temperature on the surface on which it is to be laid is less than 10°C for mixes with conventional bitumen and is less than 15°C for mixes with modified bitumen.
(v) When the wind speed ay any temperature exceeds the 40 km per hour at 2 m height.

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2.8.2 Preparation of Base

The surface on which the Asphaltic Concrete is to be laid shall be prepared in accordance with Clauses 501 and 902 of MoRT&H Specifications (Fifth revision) as appropriate, or as directed by the Engineer-in-Charge. The surface shall be thoroughly swept clean by mechanical broom and dust removed by compressed air. In locations where a mechanical broom cannot get access, other approved methods shall be used as directed by the Engineer-in-Charge.

2.8.3 Tack Coat

Where the material on which the Bituminous Concrete is to be laid is either bitumen bound layer, tack coat shall be applied @ 0.25kg/sqm, as specified in accordance with the provisions of Clause 503 of MoRT&H Specifications for road and bridge works (Fifth Revision) or as directed by the Engineer-in-Charge/OC Contract.

2.8.4. Mixing and Transportation of Mix

Mixing : Pre-mixed bituminous materials shall be prepared in a Hot Mix Plant (weight batch) type of adequate capacity and capable of yielding a mix of proper and uniform quality with thoroughly coated aggregates. The mixing temperature shall be as under. The difference in temperature between the binder and aggregate shall at no time exceed 14°C. In order to ensure uniform quality of the mix and better coating of aggregates, the hot mix plant shall be calibrated from time to time.

Bitumen Viscosity Grade	Bitumen Temperature (°C)	Aggregate Temperature (°C)	Mixed Material Temperature °C)	Laying Temperature (°C)	Rolling Temperature (°C) *
VG-30	150-165	150-170	150-165	140 Min	90 Min
VG-10	140-160	140-165	140-160	130 Min	80 Min

- Rolling must be completed before the material cools to these minimum temperatures.

If a continuous type mixing plant is used, 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 the case of a designed job mix, the bitumen and filler content shall be derived using this combined grading.

Transportation: Bituminous material shall be transported in clean insulated and covered vehicles. An asphalt release agent, such as soap or lime water, may be applied to the interior of the vehicle to prevent sticking and to facilitate discharge of the material.

2.8.5 Spreading

Prior to spreading the mix, the base shall be prepared by carrying out the required operations as per Clause 501.8 depending upon the site conditions. Except in areas where paver cannot get access, bituminous materials shall be spread, leveled and tamped by an approved self propelled paving machine equipped with an electronic sensing device. The

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essential features of the paver finisher shall conform to Annexure A of IRC:27. 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 the 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 material across the screed, free from dragging, tearing and segregation of the material. In areas with restricted space (such as confined space, foot ways, of irregular shape and varying thickness, approaches to expansion joints etc) where paver cannot be used, the material shall be spread, raked and leveled with suitable hand tools trained staff.

The minimum thickness of the material laid in each paver pass shall be in accordance with the minimum values given in the relevant parts of these specifications. When laying binder course or wearing course approaching an expansion joint of a bridge, machine laying shall stop 300 mm short of the joints. The reminder of the pavement up to the joint, and the corresponding area beyond it, shall be laid by hand, and the joint or joint cavity shall be kept clear of surfacing material.

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

2.8.6 Compaction

Bituminous materials shall be laid and compacted in layers, which enable the specified thickness, surface level, regularity requirements and compaction to be achieved.

Compaction of bituminous materials shall commence as soon as possible after laying. Compaction shall be substantially completed before the temperature falls below the minimum specified in Para 4.4.4 above. Rolling of the longitudinal joints shall be done immediately behind the paving operation. After this, rolling shall commence at the edges and progress towards the center longitudinally, except that on super-elevated and in directionally cambered portions, it shall progress from the lower to the upper edge parallel to the centerline of the pavement. Rolling shall continue until all roller marks have been removed from the surface. All deficiencies in the surface after laying shall be made good by the attendants behind the paver, before initial rolling is commenced. The initial or break down rolling shall be done with 8–10 tones static weight smooth wheeled rollers. The intermediate rolling shall be done with 8–10 Tones static weight or vibratory roller or with a pneumatic tyre roller of 12–15 tones weight with a tyre pressure of 0.56 Mpa. The contractor shall demonstrate the efficiency of the equipment proposed to be used by carrying compaction trials. The procedure for site trials shall be submitted to the for approval. The finish rolling shall be done with 6–8 tone smooth wheeled tandem rollers. Rolling shall continue until the specified compaction is achieved.

Where compaction is to be determined by density of cores the requirement to prove the performance of rollers shall apply in order to demonstrate that the specified density can be achieved. In such cases the contractor shall specify the plant, and the method by which he intends to achieve the specified level of compaction and finish at temperatures above the minimum specified rolling temperature. Laying trials shall then demonstrate the acceptability of the plant and method used.

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Bituminous materials shall be rolled in a longitudinal direction with the driven rolls nearest the paver. The roller shall first compact material adjacent to joints and then work from the lower to the upper side of the layer, overlapping on successive passes by at least one third of the width of the rear roll or, in the case of a pneumatic tyred roller, at least the nominal width of 300 mm.

In portions with super elevated and uni-directional camber, after the edge has been rolled, the roller shall progress from the lower to the upper edge.

Rollers should move at a speed of not more than 5 Km per hour. The roller shall not be permitted to stand on pavement which has not been fully compacted, and necessary precautions shall be taken to prevent dropping of oil, grease, petrol/diesel or other foreign matter on the pavement either when the rollers are operating or standing. The wheels of rollers shall be in good working order, to prevent the mix from adhering to the wheels. Only sufficient moisture to prevent adhesion between the wheels of rollers and the mix should be used. Surplus water shall not be allowed to stand on the partially compacted pavement.

2.8.7 Joints. Where joints are made, the materials shall be fully compacted and the joints made flush in one of the following ways:-

(i) All joints shall be cut vertical to the full thickness of the previously laid mix. All loosened material shall be discarded and the vertical face coated with a suitable viscosity grade hot bitumen, or cold applied emulsified bitumen. While spreading the material along the joint, the material spread shall overlap 25 mm to 50 mm on the previously laid mix beyond the vertical face of the joint. The thickness of the loose overlap material should be approximately a quarter more than the final compacted thickness. The overlapped mix shall be dragged back to the hot lane so that the roller can press the small excess into the hot side of the joint to obtain a high joint density.

(ii) By using two or more pavers operating in echelon, where this is practicable and in sufficient proximity for adjacent widths to be fully compacted by continuous rolling.

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

(iv) For transverse joints method (i) above shall apply. Transverse joints in the successive and adjoining layers have a minimum offset of 2 m.

2.8.8 Opening to Traffic

The Bituminous Concrete surface shall be covered with a wearing course within 48 hours. If there is to be any delay, by the contractor, the course shall be covered by a seal coat to the requirement of Clause 512 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.

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2.8.9 Surface Finish and Quality Control of Work

The surface finish of the completed construction shall conform to the requirement of Clause 902 of MoRT&H Specifications (Fifth Revision). For Control of the quality of materials and the works carried out, the relevant provisions of section 900 shall apply. The levels of the pavement courses as constructed shall not vary from those calculated with reference to the longitudinal and cross profile of the road shown on the drawings or as directed by the Engineer-in-Charge and OC Contract beyond the tolerance mentioned in Table 900-1.

Table 900-1: Tolerance in surface levels

1	Wearing course for flexible pavement (a) Granular (i) Machine laid (ii) Manually laid	 ± 6 mm ± 10 mm

Provided, however that the negative tolerance for wearing course shall not be permitted in conjunction with the positive tolerance for base course, if the thickness of the former is thereby reduced by more than the following limits:

- 4 mm for bituminous wearing course of thickness 40 mm or more.
- 3 mm for bituminous wearing course of thickness less than 40 mm.

For checking the compliance with the above requirement for bituminous wearing courses and concrete pavements, measurements of the surface levels shall be taken on a grid of points spaced at 6.25 m along the length and at 0.5 m from the edges and at the centre of the pavement. In any length of pavement, compliance shall be deemed to be met for the final road surface, only if the tolerance given above is satisfied for any point on the surface.

2.8.10 Surface Regularity of Pavement Courses

The longitudinal profile shall be checked with a 3 mtr long straight edge/moving straight edge as directed by the Engineer-in-Charge /OC Contract at the middle of the each traffic lane along a line parallel to the centre line of the road. The maximum permitted number of surface irregularity shall be as per table 900-2.

Table 900-2: maximum permitted number of surface irregularities

	Surface of carriage way and paved shoulders			
Irregularity	4 mm		7 mm	
Length (m)	300	75	300	75
Number of surface Irregularities on National Highway	15	9	2	1
Number of surface Irregularities on Roads of lower category	40	18	4	2

The maximum allowable difference between the road surface and under side of a 3 m straight edge when placed parallel with, or at right angles to the centre line of the road at points decided by the Engineer-in-Charge shall be ;

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For pavement surface 9bituminous and cement concrete)	3 mm
For bituminous base courses	6 mm
For granular sub base/base courses	8 mm

2.8.11 Arrangement for Traffic

During the period of execution, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

2.8.12 Measurement for Payment. Bituminous concrete shall be measured as finished work in **square meter** for 40 mm compacted thickness by any standard means to be decided by the Engineer-in Charge/OC Contract. The work shall be measured by area in Square meters at the specified thickness as specified in Schedule-'A' of tender documents.

2.8.13 Rate

The contract unit rate for the work shall be paid in full for carrying out the required operations including full compensation for:-

(i) Making arrangement for traffic to Clause 112 of MoRT&H Specifications except for initial treatment to verge, shoulders and construction of diversions;

(ii) Cleaning of the surface.

(iii) Providing all materials to be incorporated in the work including arrangement for stock yards all royalties, fees, rents where necessary and all leads and lifts.

(iv) Mixing, transporting, laying and compacting the mix as specified including all wastage in cutting joints.

(v) All labour, tools, equipments, plant including installation of Hot Mix Plant, power supply units and all machinery, incidental to complete the work to these specifications.

(vi) Carrying out the work in part widths of the road where directed.

(vii) Carrying out all tests for control of quality.

(viii) The rates include for all testing, mix design transporting and testing of samples, and cores and tests as directed by the Engineer-in-Charge/OC Contract-in-Charge. The contractor shall make all required facilities for carrying out different tests at the work site. 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 E-I-C and all costs incurred are deemed to be included in the rate quoted for the items or work. In case the test results are not produced by the contractor, quality control tests as per the frequency mentioned in the contract will be conducted by the department and the cost of testing charges as per the rates fixed by HQ CE (P) Dantak will be deducted from the contractor.

(ix) The cost of all plant and laying trials as specified to prove the mixing and laying method shall be deemed to be included in the Contractor's rates.

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2.8.14 Quality Control Tests and their minimum frequency for BC in accordance with Table 900-4 of MoRT&H Specifications for road & bridge works (Fifth Edition)

TABLE 900-4.

S/No	Type of Material	Test	Frequency (Min)
(a)	Bituminous Concrete	i) Quality of binder	Number of samples per lot and tests as per IS:73 or IRC:SP:53, IS:15462
		ii) Aggregate Impact Value/Los Angeles Abrasion Value	One test per 350 cum of aggregate for each source and whenever there is change in the quality of aggregate.
		iii) Flakiness Index and Elongation Index	One test per 350 cum of aggregate for each source and whenever there is change in the quality of aggregate.
		iv) Soundness (Magnesium and Sodium Sulphate)	One test for each source and whenever there is change in the quality of aggregate.
		v) Water absorption of aggregates	-do-
		vi) Sand equivalent test	-do-
		vii) Plasticity Index	-do-
		viii) Polished stone value	-do-
		ix) Percentage of fractured faces	One test per 350 cum of aggregate when crushed gravel is used.
		x) Mix Grading	One test for individual constituent and mixed aggregate from dryer for each 400 tonnes of mix subject to minimum of two tests per day per plant
		xi) Stability and voids analysis of mix including theoretical maximum specific of loose mix	Three tests for stability, flow value, density and void contents for each 400 tonnes of mix subject to minimum of two tests per day per plant
		xii) Moisture Susceptibility of mix (AASHTO T283)	One test for each mix type whenever there is change in the quality of source of coarse or fine aggregate.
		xiii) Temperature of binder in boiler, aggregate in dryer and mix at the time of laying and compaction	At regular intervals
		xiv) Binder Content	One set for each 400 tonnes of mix subject to minimum of two tests per day per plant
		xv) Rate of spread of mix materials	After every 5th truck load
		xvi) Density of compacted layer	One test per 700 sqm area.

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PARTICULAR SPECIFICATIONS (CONTD)

2.9 MARKING OF CENTRE AND EDGE LINE

2.9.1 General

The work shall consists of providing road markings of specified width layout and design using paint of the required specifications as given in the Contract and as per guidelines contained in IRC : 35-1997.

2.9.2 Materials

Road marking shall be hot applied thermoplastic compound, as specified in the item and the material shall meet the requirements as specified below.

2.9.3 Hot Applied Thermoplastic Road Marking

Thermoplastic Material

2.9.3.1 General

The thermoplastic material shall be homogeneously composed of aggregate, pigment, resins and glass reflecirising beads. The colour f the compound shall be white or yellow (IS Colour No 356) as specified in the drawings or as directed by the Engineer-in-Charge/OC Contract.

2.9.3.2 Requirements:

(i) **Composition** : The pigment, beads, and aggregate shall be uniformly dispersed in the resin. The material shall be free from all skins, dirt and foreign objects and shall comply with requirements indicated in Table No 800-9 of MoRT&H Specifications for Road & Bridge Works (Fifth Revision) below :-

PROPORTIONS OF CONSTITUENTS OF MARKING MATERIAL

(Percentage by weight)		
Component	**White**	**Yellow**
Binder	18.0 min.	18.0 min.
Glass beads	30-40	30-40
Titanium Dioxide	10.0 min.	-
Calcium Carbonate and Inert Fillers	42.0 max.	See note below
Yellow Pigments	-	See note below

Note: Amount of yellow pigment, calcium carbonate and inert fillers shall be at the option of the manufacturer, provided all other requirements of this specification are met.

(iii) **Properties** : The properties of thermoplastics material, when tested in accordance with ASTM D36/BS-3262- (Part I), shall be as below :-

PARTICULAR SPECIFICATIONS (CONTD)

(a) **Luminance:**

White : Daylight luminance at 45° - 65% min. as per AASHTO M 249.

Yellow: Daylight luminance at 45° - 45 % min. as per AASHTO M 249.

(b) **Drying time:** When applied at a temperature specified by the manufacturer and to the required thickness, the material shall set to bear traffic in not more than 15 minutes.

(c) **Skid resistance:** not less than 45 as per BS 6044.

(d) **Cracking resistance at low temperature:** The material shall show no cracks on application to concrete blocks.

(e) **Softening point:** 102.5° + 9.5° C as per ASTM D 36.

(f) **Yellowness Index** (for white thermoplastic paint) : not more than 0.12 as per AASHTO M- 249.

(iii) **Storage life:** The material shall meet the requirements of these Specifications for a period of one year. The thermoplastic material must also melt uniformly with no evidence of skins of unmelted particles for the one year storage period. Any material not meeting the above requirements shall be replaced by the manufacturer/supplier/Contractor.

(iv) **Reflectorisation:** Shall be achieved by incorporation of beads, the grading and other properties of the beads shall be as specified in Clause 803.4.2 of MoRT&H Specifications for Road & Bridge Works (Fifth Revision)

(v) **Marking:** Each container of the thermoplastic material shall be clearly and indelibly marked with the following information:

(a) The name, trade mark or other means of identification of manufacturer.
(b) Batch number
(c) Date of manufacture
(d) Colour (white or yellow)
(e) Maximum application temperature and maximum safe heating temperature.

(vi) **Sampling and testing :** The thermoplastic material shall be sampled and tested in accordance with the appropriate ASTM/BS method. The Contractor shall furnish to the Employer a copy of certified test reports from the manufacturers of the thermoplastic material showing results of all tests specified herein and shall certify that the material meets all requirements of this Specification.

2.9.4 Reflectorising Glass Beads

2.9.4.1 General : The specification covers two types of glass beads to be used for the production of reflectorised pavement markings. Type 1 beads are those which are a constituent of the basic thermoplastic compound vide Table 800-9 and Type 2 beads are those which are to be sprayed on the surface vide Clause 803.6.4 of MoRT&H Specifications for Road & Bridge Works (Fifth Revision)

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PARTICULAR SPECIFICATIONS (CONTD)

2.9.4.2 The glass beads shall be transparent, colourless and free from milkiness, dark particles and excessive air inclusions. These shall conform to the requirement spelt out in Clause 803.4.2.3 of MoRT&H Specifications for Road & Bridge Works (Fifth Revision)

2.9.5 Specific requirements

a) **Gradation** : The glass beads shall meet the gradation requirements for two types as given in Table 800-10 of MoRT&H Specifications for Road & Bridge Works (Fifth Revision)as below:-

GRADATION REQUIREMENTS FOR GLASS BEADS

Sieve size	Per cent retained	
	Type 1	Type 1
1.18 mm	0 to 3	
850 micron	5 to 20	0 to 5
600 micron	-	5 to 20
425 micron	65 to 95	-
300 micron	-	30 to 75
180 micron	0 to 10	10 to 30
Below 180 micron	-	0 to 15

b) **Roundness:** The glass beads shall have a minimum of 70 per cent true spheres.

c) **Refractive index :** The glass beads shall have a minimum refractive index of 1.50 .

d) **Free flowing properties :** The glass beads shall be free of hard lumps and clusters and shall dispense readily under any conditions suitable for paint striping. They shall pass the free flow test.

2.9.6 Test Methods : The specific requirements shall be tested with the following method:

(i) **Free Flow Test :** Spread 100 grams of beads evenly in a 100 mm diameter glass dish. Place the dish in a 250 mm inside diameter desiccator which is filled within 25 mm of the top of a desiccator plate with sulphuric acid water solution (specific gravity 1.10). Cover the desiccator and let it stand for 4 hours at 20 to 29°C. Remove sample from desiccator, transfer beads to a pan and inspect for lumps or clusters. Then pour beads into a clean, dry glass funnel having a 100 mm stem and 6 mm orifice. If necessary, initiate flow by lightly tapping the funnel. The glass spheres shall be essentially free of lumps and clusters and shall flow freely through the funnel.

(ii) The requirements of gradation, roundness and refractive index of glass beads and the amount of glass beads in the compound shall be tested as per BS 6088 and BS 3262 (Part I).

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(iii) The Contractor shall furnish to the Employer a copy of certified test reports from the manufacturer of glass beads obtained from a reputed laboratory showing result of all tests specified herein and shall certify that the material meets all requirements of this Specification. However, if so required, these tests may be carried out as directed by the Engineer-in-Charge/OC Contract.

2.9.7 Application properties of thermoplastic material

2.9.7.1 The thermoplastic material shall readily get screeded/extruded at temperatures specified by the manufacturers for respective method of application to produce a line of specified thickness which shall be continuous and uniform in shape having clear and sharp edges.

2.9.7.2 The material upon heating to application temperatures, shall not exude fumes, which are toxic, obnoxious or injurious to persons or property.

2.9.8 Preparation

2.9.8.1 The material shall be melted in accordance with the manufacturer‟s instructions in a heater fitted with a mechanical stirrer to give a smooth consistency to the thermoplastic material to avoid local overheating. The temperature of the mass shall be within the range specified by the manufacturer, and shall on no account be allowed to exceed the maximum temperature stated by the manufacturer. The molten material should be used as expeditiously as possible and for thermoplastic material which has natural binders or is otherwise sensitive to prolonged heating, the material shall not be maintained in a molten condition for more than 4 hours.

2.9.8.2 After transfer to the laying equipment, the material shall be maintained within the temperature range specified by the manufacturer for achieving the desired consistency for laying.

2.9.9 Properties of finished road marking

2.9.9.1 The finished lines shall be free from ruggednedd on sides and ends and be parallel to the general alignment of the carriageway. The upper surface of the lines shall be level, uniform an free from streaks.

(a) The strip shall not be slippery when wet.

(b) The marking shall not lift from the pavement in freezing weather.

(c) After application and proper drying, the strip shall show no appreciable deformation or discolouration under traffic and under road temperatures upto 60º C.

(d) The marking shall not deteriorate by contact with sodium chloride, calcium chloride or oil drippings from traffic.

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(e) The stripe or marking shall maintain its original dimensions and position. Cold ductility of the material shall be such as to permit normal movement with the road surface without chopping or cracking.

(f) The colour of yellow marking shall conform to IS Colour No. 356 as given in IS: 164.

2.9.10 Measurement for Payment

The painted marking shall be measured in **"Square Meter"** of actual area marked (excluding gaps, if any).

2.9.11 Rate

The Contract unit rate for road markings shall be payment in full compensation for furnishing all labour, materials, tools equipment, including all incidental costs necessary for carrying out the work at the site conforming to these Specifications complete as per the approved drawing (s) or as directed by the Engineer-in-Charge/OC Contract and all other incidental costs necessary to complete the work to these specifications.

2.10. ROAD DELINATORS

2.10.1 Scope

The work shall cover supplying and fixing roadway indicators, hazard markers and object markers. Roadway indicators shall be properly installed to indicate the horizontal alignment and vertical profile of the roadway so as to outline the vehicle path for safe driving. Hazard markers shall be installed immediately ahead of obstruction of vehicular path such as just before a narrow bridge. Object markers shall be erected where obstruction within the roadway starts such as chennelising island in approaches to intersections.

2.10.2 The design, materials to be used and the location of the road delineators (roadway indicators, hazard markers and object markers) shall conform to Recommended Practice for Road Delineators, IRC:79, and to relevant drawings or as otherwise directed by the Engineer. The steel drums such as empty bitumen drums shall not be used as they could pose safety hazards, The delineators shall be retro-reflectorised as shown on the drawings or as directed by the Engineer. The reflectors on the delineators shall be of retro-reflective sheeting with encapsulated lens and with the visibility of 300m under clear weather conditions, when illuminated by the upper beam o the car headlights.

2.10.3. Installation

The delineators shall be so installed that their posts do not change their orientation and the reflectorised faces are always perpendicular to the direction of travel.

2.10.4. Measurement for Payments.

The measurement shall be made in number of delineators supplied and fixed at site.

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PARTICULAR SPECIFICATIONS (CONTD….)

2.10.5. Rates

The Contract unit rates of delineators shall be payment in full compensation for furnishing all labour, materials, tools equipment including incidental costs necessary to complete the work to these Specifications.

2.11. REFLECTIVE PAVEMENT MARKERS (ROAD STUDS)

2.11.1 Scope

The work shall cover the providing and fixing of reflective pavement marker (RPM) or road stud, a device which is bonded to or anchored within the road surface, for lane marking and delineation for night-time visibility, as specified in the Contract.

2.11.2. Material

2.11.2.1. Plastic body or RPM/road stud shall be moulded from ASA (Acrylic Styrene Acrylonitrite) or HIPS (Hi-impact Polystyrene) or Acrylonitrile Butadiene Styrene (ABS) or any other suitable material approved the Engineer. The markers shall support a load of 13,635 Kg tested in accordance with ASTM D 4280.

2.11.2.2. Reflective panels shall consist of number of lenses containing single or dual prismatic cubes capable of providing total internal reflection of the light entering the lens face. Lenses shall be moulded of methyl methecrylate conforming to ASTM D 788 or equivalent.

2.11.3 Design

The slope or retro-reflecting surface shall preferably be 35 ± 5^{o} to base and the area of each retro-reflecting surface shall not be less than 13.0 sq.cm.

2.11.4 Optical Performance

2.11.4.1 Unidirectional and Bi-directional Studs

Each reflector or combination of reflectors on each face of the stud shall have a Coefficient of Luminous Intensity (C.I.L) not less than that given in Tables 800-13 or 800-14 as appropriate.

2.11.4.2 Omni-directional Studs

Each omni-directional stud shall have C.I.L. of not less than 2 mcd/lx.

Table 800-13 : Minimum C.I.L. Values for Category 'A'Studs

Entrance Angle	Observation Angle	C.I.L. in mcd/lx		
		White	Amber	Red
0^{o} U 5^{o} L&R	0.3^{o}	220	110	44
0^{o} U 10^{o} L&R	0.5^{o}	120	60	24

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Table 800-14 : Minimum C.I.L. Values for Category 'B'Studs

Entrance Angle	Observation Angle	C.I.L. in mcd/lx		
		White	Amber	Red
0^o U 6^o L&R	0.3^o	20	10	4
0^o U 10^o L&R	0.5^o	15	7.5	3

Note :

1) The entrance angle of 0^o U corresponds to the normal aspect of the reflectors when the reflecting road stud is installed in horizontal road surface.

2) The stud incorporating one or more corner cube reflectors shall be included in Category 'A'. The stud incorporating one or more b-convex reflectors shall be included in Category 'B'.

2.11.5 Tests

2.11.5.1 Co-efficient of luminance intensity can be measured by procedure described in ASTM E 809 "Practice for Measuring Photometric Characteristics" or as recommended in BS:873-Part 4 : 1973.

2.11.5.2 Under test conditions, a stud shall not be considered to fail the photometric requirements if the measured C.I.L. at any one position of measurement is less than the values specified in Tables 800-13 or 800-14 provided that

i) the value is not less than 80 percent of the specified minimum, and

ii) the average of the left and right measurements for the specific angle is greater that the specified minimum.

2.12 Miscellaneous

The specification of any item not covered in the above technical specification, the Indian Standard Specification applicable for the Border Roads Organisation shall be followed.

2.13 Drawing of Surfacing Works (Cross Section)

Drawings of Surfacing works such as Cross Section can be seen in the office of Chief Engineer Project Dantak for reference purpose. However, drawings for surfacing works (Cross Section) will be provided by OC Contract to execute work at the time of execution. Contractor shall execute work as per drawing provided by OC Contract.

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PART-II PRICED BID

S C H E D U L E - "A" NOTES

CONSTRUCTION OF 20 NOS OF 2 MTR SPAN RCC CULVERTS IN CONVENTIONAL METHOD AND PROVIDING AND LAYING OF WMM 100 MM AND 75 MM COMPACTED THICKNESS, DBM 60 MM COMPACTED THICKNESS AND BC 40 MM COMPACTED THICKNESS INCLUDING APPLICATION OF PRIME COAT, TACK COAT, ROLLING AND COMPACTION AS PER MORT&H SPECIFICATIONS AND ROAD MARKING WITH THERMOPLASTIC PAINT 2.50 MM THICK CONFORMING TO MOST 803.4 INCLUDING PREPARATION OF SURFACE FOR CARRYING OUT SURFACING WORKS BETWEEN KM 48.000 TO KM 53.000 ON CONFLUENCE - HAA ROAD UNDER 19 BRTF OF PROJECT DANTAK INSIDE BHUTAN.

1. Quantity shown in Schedule 'A' is approximate and is inserted as guide only. These shall, however not be varied beyond the limits laid down in condition 7 of IAFW-2249 General Condition of contracts. **The contract will be accepted as a whole as per the descrition of the Accepting Officer.**

2. The rates and amount in Schedule 'A' are to be filled in by the tenderer. The rates shall be filled both in figures as well as in words. In case of variation between the rates quoted in figure and words, the rates in words shall take precedence.

3. **Period of Completion** :- The entire works of Schedule 'A' under this contract shall be completed within **365** days in accordance with the phasing, if any, indicated in the tender from the date of placing of work order, which will be usually within two week from the date of issue of Acceptance letter.

4. Any drawings mentioned in the tender documents/particular specifications but it is inadvertently not included in the list of drawings, shall also be deemed to form part of the contact and Tenderer may see such drawings/details in the office of Accepting Officer/concerned OC Contracts and shall be supplied by Deptt.

5. The layout of work as indicated in site plan/layout plan is tentative and may be varied where necessary at the discretion of the OC Contact. The contactor shall not be entitled for any claim on account of any such variation.

6. The rates to be quoted by the tenderer in the schedule 'A' shall be deemed to include for the provision of all labour and materials, loading and unloading of materials and transportation if required, tools, plant, equipment and tackle, process, operations and specific requirements details in the schedule in the particular specification and elsewhere in this tender documents and for the full, entire and final completion of the work in accordance with the provisions of these tender documents.

7. The rate quoted by the contractor shall be deemed to be inclusive of all Taxes (including Sales Tax/VAT on materials, Sales, Tax/VAT on works contracts, Turnover Tax, Service Tax, etc), duties, Royalties, Octroi, State Entry Tax & other levies payable under the respective statutes. No re-imbursement/refund for variation in rates of taxes, duties royalties, Octroi, State Entry tax & other levies, and or imposition/abolition of any new/existing taxes, duties, royalties, octroi, state entry Tax & other levies shall be made except as provided in Special Condition.

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S C H E D U L E – 'A' NOTES CONTD

8. The rate to be quoted by the tenderer in respect of these work shall be deemed to include for all minor details of construction which are obviously and fairly intended and which may not have been specifically mentioned in the tender documents but which are essential for satisfactory execution and completion of work. In case of difference of opinion between the OC Contract and the Contractor as to what constitutes a minor details of construction, the decision of Accepting Officer shall be final and binding.

9. Rates to be quoted by the contractors shall be deemed to include for all items of work as described, specified in particular specification and on drawing.

10. The rates to be quoted by the contractor for various items shall include for "material and labour"/"Supply and fix" connecting' Jointing, Testing and Commissioning complete unless otherwise specifically mentioned therein.

11. The amount of contract is not firm but shall be treated as the contract sum as referred to in condition 1 (n) of IAFW-2249.

12. Work shall be executed on locations as shown in site plan or as directed by the OC Contract/Engineer-in-Charge.

13. Measurements of work done shall be as per units of items given in Schedule 'A' and this mode of measurement shall take as per Clause 113 of MoRT&H Specification for road & Bridge works (Fifth Revision). The rate be quoted considering Clause 114 of MoRT&H Specification road & Bridge works (Fifth Revision)

14. Unit RM, mm, Cum or Cm, Sqm, Kg and quintal or Qtl wherever mentioned in the tender documents denotes the unit, Running Metre, Millimetre, Cubic Metre, Square Metre, Kilogram and Quintal respectively.

15. The works under this contract will be carried out within the working hours as per directions of Accepting Officer or the officer so detailed by him for administration of this contract.

16. The security will be arranged by the contactor for his personnel and equipment during the execution of work. No compensation will be paid by BRO on account of any loss/damage to personnel, property, veh/eqpt/plant of contactor during execution of work or on any account.

17. Site for execution of work shall be handed over on the date of commencement of the work as indicated in the work order No 01. In case it is not possible for the department to handover the entire site on the date of commencement and certain portion of the site is handed over later on then contactor shall make his planning/deployment of resources accordingly and no claims of whatsoever nature on the account shall be entertained.

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SCHEDULE 'A'/BILL OF QUANTITIES

CONSTRUCTION OF 20 NOS OF 2 MTR SPAN RCC CULVERTS IN CONVENTIONAL METHOD AND PROVIDING AND LAYING OF WMM 100 MM AND 75 MM COMPACTED THICKNESS, DBM 60 MM COMPACTED THICKNESS AND BC 40 MM COMPACTED THICKNESS INCLUDING APPLICATION OF PRIME COAT, TACK COAT, ROLLING AND COMPACTION AS PER MORT&H SPECIFICATIONS AND ROAD MARKING WITH THERMOPLASTIC PAINT 2.50 MM THICK CONFORMING TO MOST 803.4 INCLUDING PREPARATION OF SURFACE FOR CARRYING OUT SURFACING WORKS BETWEEN KM 48.000 TO KM 53.000 ON CONFLUENCE - HAA ROAD UNDER 19 BRTF OF PROJECT DANTAK INSIDE BHUTAN.

S/No	Description of Works	A/U	Qty	Rate per Unit to be quoted by the Bidder		Amount	
				Figures	Words	Figures	Words
	Pmt Works						
1.	Excavation in trenches not exceeding 1.20 mtr width and 1.50 mtr depth in soil/soil mixed with boulders (SMB) including dressing bottom and sides getting out and disposing all excavated material lead up to 6 mtr and lift up to 1.5 mtr by manual means	Cum	3103.03				
2.	Excavation in trenches not exceeding 1.20 mtr width and 1.50 mtr depth in Hard rock (HR) by drilling with compressor,blasting and getting out including stacking up serviceable material and disposal of unserviceable materials lead up to 6 mtr and lift up to 1.5 mtr by manual means	Cum	1329.87				
3.	Plain Cement Concrete 1:4:8 (1cement : 4 sand : 8 Stone aggregate of size 4 cm graded downwards) in foundation or elsewhere by mechanically mixed including curing (excluding the cost of centering/shuttering)	Cum	505.66				
4.	Plain Cement Concrete 1:3:6 (1cement : 3 sand : 6 Stone aggregate of size 4 cm graded downwards) in foundation or elsewhere by mechanically mixed including curing (excluding the cost of centering/shuttering)	Cum	224.29				
5.	Plain Cement Concrete 1:2:4 (1 cement : 2 coarse sand : 4 Stone aggregate of size 4 cm graded downwards) in foundation or elsewhere by mechanically mixed including curing for 14 days (excluding the cost of centering/shuttering) (For Abutments, Return Walls, Curtain Walls, Wearing Coat, Vent Way & Coping of P/Wall etc)	Cum	1803.90				
6.	Reinforced Cement Concrete M-20 nearly corresponding to nominal mix, 1 cement : 1.5 sand : 3 stone aggregate of size 20 mm graded downward by mechanically mixed including curing for 14 days (excluding the cost of reinforcement and centering/shuttering)	Cum	149.10				
	Total of srl page No. 211						

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CONSTRUCTION OF 20 NOS OF 2 MTR SPAN RCC CULVERTS IN CONVENTIONAL METHOD AND PROVIDING AND LAYING OF WMM 100 MM AND 75 MM COMPACTED THICKNESS, DBM 60 MM COMPACTED THICKNESS AND BC 40 MM COMPACTED THICKNESS INCLUDING APPLICATION OF PRIME COAT, TACK COAT, ROLLING AND COMPACTION AS PER MORT&H SPECIFICATIONS AND ROAD MARKING WITH THERMOPLASTIC PAINT 2.50 MM THICK CONFORMING TO MOST 803.4 INCLUDING PREPARATION OF SURFACE FOR CARRYING OUT SURFACING WORKS BETWEEN KM 48.000 TO KM 53.000 ON CONFLUENCE - HAA ROAD UNDER 19 BRTF OF PROJECT DANTAK INSIDE BHUTAN.

S/No	Description of Works	A/U	Qty	Rate per Unit to be quoted by the Bidder		Amount	
				Figures	Words	Figures	Words
7.	Filling of stones/selected material in layers well packed behind retaining walls, breast walls, abutment/wingwalls of culverts including cost of labour and material.	Cum	889.47				
8.	Earthwork in Embankment including excavation of earth and filling with earth work free from roots etc spreading in layers not exceeding 30 cm including watering, rolling & finishing to required slope and level not exceeding 1.50 m above the base in plain area and for approaches to culverts in ordinary soil including cost of soil.	Cum	60.90				
9.	Laying reinforcement including cutting bending, binding, providing hooks, overlaps etc bars upto 12 mm dia (labour only).	Kgs	6272.70				
10.	Laying reinforcement including cutting bending, binding, providing hooks, overlaps etc bars above 12 mm dia (labour only).	Kgs	15237.60				
11.	Centering/Shuttering (Steel) including strutting, propping and removal of formwork (considering 10 times to be used)	Sqm	4658.22				
12.	Providing and laying rubble stones including hand packing and filling interstices in aprons, revetments, pitching to any slope or profile to required thickness (material and labour).	Cum	50.40				
13.	Providing/laying Weep Holes of size 4"x4"xm using PVC Pipe 4" dia with Plain Concrete 1cement: 4coarse sand: 8 stone aggregates)	Mtr	2228.80				
14.	Cost of Steel	Kgs	21510.30				
	Total of srl page No. 212						

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S/No	Description of Works	A/U	Qty	Rate per Unit to be quoted by the Bidder		Amount	
				Figures	Words	Figures	Words
	Surf Works						
15.	Providing, laying, spreading and compacting graded stone aggregate grading as per Table 400 – 11 and satisfying the physical requirement as per Table No 400-10 of MoRT&H specifications for WMM specifications to a thickness of **100 mm** including premixing the materials with water to OMC in mechanical mix (Pug mill) laying in uniform layers in sub base/base course on a well prepared base and compacting with power vibratory roller to achieve the desired density including grading.	Sqm	22150.51				
16.	Providing, laying, spreading and compacting graded stone aggregate grading as per Table 400 – 11 and satisfying the physical requirement as per Table No 400-10 of MoRT&H specifications for WMM specifications to a thickness of **75 mm** including premixing the materials with water to OMC in mechanical mix (Pug mill) laying in uniform layers in sub base/base course on a well prepared base and compacting with power vibratory roller to achieve the desired density including grading.	Sqm	76878.80				
	Total of srl page No. 213						

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CONSTRUCTION OF 20 NOS OF 2 MTR SPAN RCC CULVERTS IN CONVENTIONAL METHOD AND PROVIDING AND LAYING OF WMM 100 MM AND 75 MM COMPACTED THICKNESS, DBM 60 MM COMPACTED THICKNESS AND BC 40 MM COMPACTED THICKNESS INCLUDING APPLICATION OF PRIME COAT, TACK COAT, ROLLING AND COMPACTION AS PER MORT&H SPECIFICATIONS AND ROAD MARKING WITH THERMOPLASTIC PAINT 2.50 MM THICK CONFORMING TO MOST 803.4 INCLUDING PREPARATION OF SURFACE FOR CARRYING OUT SURFACING WORKS BETWEEN KM 48.000 TO KM 53.000 ON CONFLUENCE - HAA ROAD UNDER 19 BRTF OF PROJECT DANTAK INSIDE BHUTAN.

S/No	Description of Works	A/U	Qty	Rate per Unit to be quoted by the Bidder		Amount	
				Figures	Words	Figures	Words
17.	Providing and laying **60 mm** thick **Dense Bituminous Macadam (DBM)** layer with pre-coated stone aggregate, physical requirements/grading/mix composition as per Table 500/8/9/10 respectively of MoRT&H specifications for road and bridge works (Fifth Revision) mixed with 4.25% by weight of total mix as binder asphalt VG-10 penetration grade and rolled to the required specifications as per clause 505 of MoRT&H Specifications (Fifth Revision), all as specified in particular specifications.	Sqm	37692.60				
18.	Providing and laying of **40 mm thick Bituminous Concrete (BC)** layer conforming to clause 507 of MoRT&H specifications for road and bridge work (Fifth Revision) including cost of coarse aggregates, fine aggregates, filler, Bitumen VG-10, Anti Stripping Agent, Warm Mix Additives (quantity, quality and grade as per the approved Job Mix Formula) etc, cleaning of the road surface, application of tack coat with appropriate grade bitumen, cleaning and pre-heating of the mineral aggregate, filler & bitumen to the specific temperature, thoroughly mixing with binder of specified bitumen content, Anti Stripping Agent, Warm Mix Additives as per mix design in Hot Mix Plant of 20-30Ton/40-60T capacity, carrying the hot mixed materials by means of tipper, trucks, or any other approved and suitable arrangements, laying the hot premixed materials over the prepared surface by means of paver finisher including manual operation as and when required for proper grade, level and camber thorough rolling with power roller with necessary hand packing and pinning to give an even surface, including running expense of all plants and machineries, inclusive of proper traffic control during laying to the satisfaction of Engineer-in-Charge/OC Contract, required quality control tests at required interval etc complete in all respect as directed.	Sqm	37692.60				
	Total of srl page No. 214						

EE (C)
SW
For Accepting Officer

(Signature of the Contractor)

SCHEDULE 'A'/BILL OF QUANTITIES CONTD

CONSTRUCTION OF 20 NOS OF 2 MTR SPAN RCC CULVERTS IN CONVENTIONAL METHOD AND PROVIDING AND LAYING OF WMM 100 MM AND 75 MM COMPACTED THICKNESS, DBM 60 MM COMPACTED THICKNESS AND BC 40 MM COMPACTED THICKNESS INCLUDING APPLICATION OF PRIME COAT, TACK COAT, ROLLING AND COMPACTION AS PER MORT&H SPECIFICATIONS AND ROAD MARKING WITH THERMOPLASTIC PAINT 2.50 MM THICK CONFORMING TO MOST 803.4 INCLUDING PREPARATION OF SURFACE FOR CARRYING OUT SURFACING WORKS BETWEEN KM 48.000 TO KM 53.000 ON CONFLUENCE - HAA ROAD UNDER 19 BRTF OF PROJECT DANTAK INSIDE BHUTAN.

S/No	Description of Works	A/U	Qty	Rate per Unit to be quoted by the Bidder		Amount	
				Figures	Words	Figures	Words
19.	Providing and applying Prime Coat with bitumen emulsion on prepared surface of granular base including cleaning of road surface and spraying @ 7.50 kg per 10 sqm (using BPD with manual labour)	Sqm	37692.60				
20.	Providing and applying Tack Coat with bitumen VG-10 using bitumen pressure distributor @ 2.5 Kg/10 Sqm on prepared bituminous/granular surface cleaned with mechanical broom, all complete as per clause 503 of MoSRT&H specifications.	Sqm	75385.20				
21.	Road marking with thermoplastic paint (2.5 mm thick) conforming to MOST: 803.4 including preparation of surface and application.	Sqm	2011.20				
	Total of srl page No. 215						

EE (C)
SW
For Accepting Officer

(Signature of the Contractor)

SCHEDULE 'A'/BILL OF QUANTITIES CONTD

COLLECTION OF SCHEDULE 'A'/BILL OF QUANTITIES

CONSTRUCTION OF 20 NOS OF 2 MTR SPAN RCC CULVERTS IN CONVENTIONAL METHOD AND PROVIDING AND LAYING OF WMM 100 MM AND 75 MM COMPACTED THICKNESS, DBM 60 MM COMPACTED THICKNESS AND BC 40 MM COMPACTED THICKNESS INCLUDING APPLICATION OF PRIME COAT, TACK COAT, ROLLING AND COMPACTION AS PER MORT&H SPECIFICATIONS AND ROAD MARKING WITH THERMOPLASTIC PAINT 2.50 MM THICK CONFORMING TO MOST 803.4 INCLUDING PREPARATION OF SURFACE FOR CARRYING OUT SURFACING WORKS BETWEEN KM 48.000 TO KM 53.000 ON CONFLUENCE - HAA ROAD UNDER 19 BRTF OF PROJECT DANTAK INSIDE BHUTAN.

(a)	Total brought forward from srl page No.211	Rs.	
(b)	Total brought forward from srl page No.212	Rs.	
(c)	Total brought forward from srl page No.213	Rs.	
(d)	Total brought forward from srl page No.214	Rs.	
(e)	Total brought forward from srl page No.215	Rs.	
	Grand Total	**Rs**	

Total (Rupees_____)

EE (C)
SW
For Accepting Officer

(Signature of the Contractor)

SCHEDULE `B'

(ISSUE OF STORES TO THE CONTRACTOR)

CONSTRUCTION OF 20 NOS OF 2 MTR SPAN RCC CULVERTS IN CONVENTIONAL METHOD AND PROVIDING AND LAYING OF WMM 100 MM AND 75 MM COMPACTED THICKNESS, DBM 60 MM COMPACTED THICKNESS AND BC 40 MM COMPACTED THICKNESS INCLUDING APPLICATION OF PRIME COAT, TACK COAT, ROLLING AND COMPACTION AS PER MORT&H SPECIFICATIONS AND ROAD MARKING WITH THERMOPLASTIC PAINT 2.50 MM THICK CONFORMING TO MOST 803.4 INCLUDING PREPARATION OF SURFACE FOR CARRYING OUT SURFACING WORKS BETWEEN KM 48.000 TO KM 53.000 ON CONFLUENCE - HAA ROAD UNDER 19 BRTF OF PROJECT DANTAK INSIDE BHUTAN.

1. The contractor has to make his own arrangement for all stores/materials required for completion of the entire work contracted for.

S No	Particulars	A/U	Rate at which stores will be issued to the contractor	Place of issue	Remarks
	NIL				

Notes:-

a. The stores listed above shall be issued as per the actual requirement for the works as per Schedule 'A'.

b. The recoveries shall be made from the contractor for the gross quantities issued for the work at the rate specified above.

c. It shall be responsibility of the contractor to submit his demand for stores in writing atleast seven days in advance of his requirements for supply under Schedule 'B' stores, otherwise, Contractor will produce original invoices if purchased from original manufactures.

d. If the contractor requires any of the stores listed above to be issued to him for making good any loss or damage to works arising from any cause whatsoever other than the accepted risks and the Government issues the same to him, the rates of issue for such items of stores shall be Schedule 'B' rate or market rate on the date of issue of stores, whichever is higher.

EE(C)
SW
For Accepting Officer

(Signature of the Contractor)

SCHEDULE `C'

LIST OF TOOLS AND PLANT (OTHER THAN TRANSPORT) WHICH WILL BE HIRED TO THE CONTRACTOR)

CONSTRUCTION OF 20 NOS OF 2 MTR SPAN RCC CULVERTS IN CONVENTIONAL METHOD AND PROVIDING AND LAYING OF WMM 100 MM AND 75 MM COMPACTED THICKNESS, DBM 60 MM COMPACTED THICKNESS AND BC 40 MM COMPACTED THICKNESS INCLUDING APPLICATION OF PRIME COAT, TACK COAT, ROLLING AND COMPACTION AS PER MORT&H SPECIFICATIONS AND ROAD MARKING WITH THERMOPLASTIC PAINT 2.50 MM THICK CONFORMING TO MOST 803.4 INCLUDING PREPARATION OF SURFACE FOR CARRYING OUT SURFACING WORKS BETWEEN KM 48.000 TO KM 53.000 ON CONFLUENCE - HAA ROAD UNDER 19 BRTF OF PROJECT DANTAK INSIDE BHUTAN.

S/ No	Quantity/ Particulars	Details of crew supplied	Hire charges per unit per working day	Stand by charges per unit per OFF day	Place of issue by name	Remarks
NIL						

SCHEDULE `D'

TRANSPORT TO BE HIRED TO THE CONTRACTOR

CONSTRUCTION OF 20 NOS OF 2 MTR SPAN RCC CULVERTS IN CONVENTIONAL METHOD AND PROVIDING AND LAYING OF WMM 100 MM AND 75 MM COMPACTED THICKNESS, DBM 60 MM COMPACTED THICKNESS AND BC 40 MM COMPACTED THICKNESS INCLUDING APPLICATION OF PRIME COAT, TACK COAT, ROLLING AND COMPACTION AS PER MORT&H SPECIFICATIONS AND ROAD MARKING WITH THERMOPLASTIC PAINT 2.50 MM THICK CONFORMING TO MOST 803.4 INCLUDING PREPARATION OF SURFACE FOR CARRYING OUT SURFACING WORKS BETWEEN KM 48.000 TO KM 53.000 ON CONFLUENCE - HAA ROAD UNDER 19 BRTF OF PROJECT DANTAK INSIDE BHUTAN

S/No	Quantity/Particulars	Rate per unit per working day	Place of issue	Remarks
NIL				

EE(C)
SSW
For Accepting Officer

(Signature of the Contractor)

A C C E P T A N C E

_____alterations have been made in this documents and as evidence that these alterations were made before the execution of this contract agreement, they have been initialed by the contractor and Shri_____, HQ CE (P) DANTAK. The said Officer(s) is/are hereby authorised to sign and initial on my behalf the documents, forming part of the contract on my behalf.

The above tender was accepted by me on……day of ……. 2020, on behalf of the President of India for the contract sum of Rs _____ (Rupees _____ _____Only) at the item rates quoted in Schedule 'A' in favour of _____ _____

Signature

Brig
Chief Engineer
Project Dantak
Accepting Officer
For and on behalf of the President of India

Signed this ____ day of _____ 2020

EE(C)
SW
For Accepting Officer

(Signature of the Contractor)

TENDER

To

The President of India
Through the Chief Engineer
Project DANTAK* (*Referred to also as Accepting Officer elsewhere in the tender documents).

Having examined and perused the following documents forming part of tender documents :-

1. Particular/technical specifications.
2. Ministry of Road Transport & Highways (MoRTH) specifications for Road and Bridge works (Fifth Revision) published by Indian Road Congress New Delhi.
3. Detailed specifications/other tender documents.
4. Schedule 'A', 'B', 'C' & 'D' attached here to
5. Special Conditions of the Contract
6. General Conditions of Contracts IAFW-2249 (1989 Print) including amendments 1 to 16 and errata No 1 to 20.
7. All other documents forming part of tender documents

Should this tender be accepted, I/We agree:-

To execute all the works referred to in the said documents upon the terms and conditions contained or referred to therein at the item rates continued in the aforesaid Schedule 'A' or at such other rates to be fixed under the provision of condition **62** of IAFW-2249 and to carry out such deviations as may be ordered vide condition **7** of General Condition of Contacts up to a maximum of **10 percent** and further agree to refer all disputes as required by condition **70** & **71** of the General Conditions of the contract (IAFW-2249) to the Sole Arbitration of an serving Engineer Officer to be appointed by **the Director General Border Roads, New Delhi or in his absence, by the officer officiating as Director General Border Roads**, whose decision shall be final, conclusive and binding. However, in case of disputes with **PSC** and or **PSU** the same will be referred to a Sole Arbitrator to be appointed by Secretary, Bureau of Public Sector Enterprises (refer Special condition **22** of tender documents).

Signature of Contractor

in the capacity of_____ duly

Witness:

authorized to sign the tender for and on behalf

(Name in Block letters)

of M/s_____

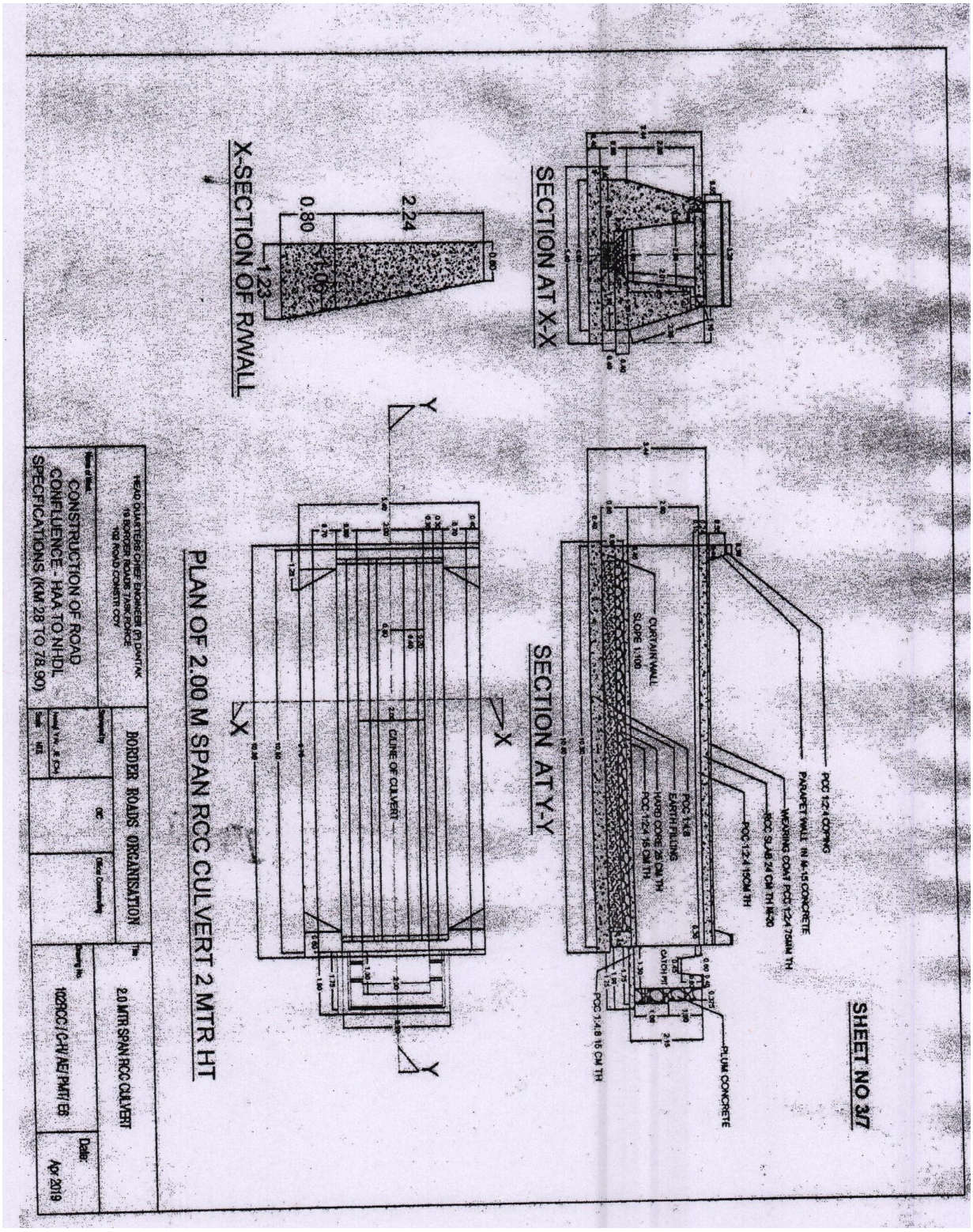
Address----------

(In Block letters)

Postal address: - _____

EE(C)
SW
For Accepting Officer

(Signature of the Contractor)



EE(C)
SW
For Accepting Officer

(Signature of the Contractor)