



RASHTRIYA ISPAT NIGAM LIMITED
VISAKHAPATNAM STEEL PLANT
MINES DEPARTMENT
VISAKHAPATNAM-530031
PHONE NO: 0891-2519545, TELEFAX NO:0891-2518669

NAME OF THE WORK: *Repair to BT road from VSP township to Oddugudem at Madharam Dolomite Mines.*

Open Tender Notice No. : VSP/Mines-10/2016-17 Date: 17.09.2016

PERIOD OF CONTRACT : **04 (Four) Months**
DEFECT LIABILITY PERIOD : **06 (six) months**
ENGINEER : **Dy. Manager (Civil) / MDM**

ISSUED TO SRI/ M/s. _____

Note: Tenderer has to fill the data wherever and whatever required in the tender schedule without fail and sign all the pages

No of pages of BOQ alone: **01 (One) pages only**

Total No. of pages : **48(Forty Eight) pages only**

(FOR OFFICE USE ONLY)

1. E.M.D. PARTICULARS	:	
2. Sl.No.	:	OUT OF TENDERS
3. COVERING LETTER	:	NO. OF PAGES:
4. REBATE OFFERED	:	
5. RATE WRITTEN IN WORDS	:	
6. VALIDITY OF TENDER	:	4 MONTHS FROM THE DATE OF OPENING
SIGNATURE OF MINES DEPT. REPRESENTATIVE		SIGNATURE OF FINANCE DEPARTMENT REPRESENTATIVE



RASHTRIYA ISPAT NIGAM LIMITED / VISAKHAPATNAM STEEL PLANT
MINES DEPARTMENT, C-Block, IInd Floor, North Wing, Administrative Building
VISAKHAPATNAM – 530 031

Phone: 0891-2519545, Fax: 0891-2518669

Open Tender Notice No. : VSP/Mines-10/2016-17 Date: 17.09.2016

Sealed Tender along with Earnest Money Deposit (EMD) is invited from experienced contractors work for the following works:

NAME OF THE WORK:- Repair to BT road from VSP township to Oddugudem at Madharam Dolomite Mines.

Note: The agency should have experience in Road Construction / maintenance works.

Cost of Tender Document (Non-refundable)		Eligibility / experience requirements		Earnest Money Deposit (Rs)
By Hand (Rs)	By Downloading from Web Site of www.vizagsteel.com (Rs)	Value of single similar work executed (Rs. In Lakhs)	Annual Turn over (Rs. In lakhs)	
600/=	600/=	1.57	0.94	5,000/=

2. Cost of Tender document shall be paid in the form of DD obtained from any Nationalised or scheduled bank drawn in favour of RIN Ltd, payable on State Bank of India, Madharam, Code No.8793. *THE COST OF TENDER DOCUMENT RECEIVED ALONGWITH TENDER CUMENT WILL NOT BE REFUNDED UNDER ANY CIRCUMSTANCES UPON RECEIPT OF TENDER.*

3. The value of single similar work executed shall be during the last 07(Seven) years ending last day of month previous to Tender Notice date i.e **31.08.2016** and Turnover shall be the average Annual Financial Turn over during the last three years ending 31st March of the previous financial year i. e **31-03-2016**. The tender document shall be accompanied with copies of **a) Work Order, Bill of Quantities, Completion Certificate with details of value of work executed (b) for Turn Over Audited Balance Sheets certified by Practicing Chartered Account in case the annual Turnover is more than Rs.40.00 Lakhs (or) in case of Turnover is less than Rs.40.00 lakhs either Turnover Certificate in the prescribed format of VSP duly signed by a Practicing Chartered Accountant/Cost Accountant or T.D.S. Certificate (s) comprising the Gross Bill values issued by the Deductor (s) for the work done. : Tender Documents will not be opened/considered if the above documents are not enclosed along with the offer.. The authorized representative of the tenderer shall sign on all the copies of the documents submitted along with the tender document.**

Note :

a) Tenderer shall submit PF registration certificate if available , if not available successful tenderer shall submit PF registration certificate before commencement of work.

b) Tenderer shall submit VAT registration certificate under APVAT act if available, if not available successful tenderer shall submit VAT registration certificate under APVAT act before signing the Work order / Letter of Acceptance and submit a copy of the same.

4. The tenderers are requested to note that

4.1 The offer shall be made in 02(Two) envelopes. **FIRST ENVELOPE** (to be super scribed as ENVELOPE-1 with name of the work, Name of the Contractor tender notice number should contain the cost of the tender document in case the tender is downloaded from the web site (Tender can be purchased from the Office of DGM(Mines) by paying tender cost in the form of DD as cited at Para-2 above in which case tender cost need not be enclosed while submitting the tender), Earnest Money Deposit (EMD) separately in the form of DD/BC/BG etc (refer to instruction to tenderer) and pre-qualification documents (Criteria eligibility/experience and other documents, etc as cited at Para (03) above) duly signed / attested by the authorized representative of the Company as per Para-1 read with Para-3 above. **SECOND ENVELOPE** (to be super scribed as ENVELOPE-2 with name of the work, Name of the Contractor ,tender notice number) should contain price bid in its prescribed format along with the tender document.

4.2 The first cover shall be opened initially and only on satisfying the eligibility criteria, adequacy of cost of tender document (in case of downloaded tender), EMD etc, placed in it, the second envelope containing the price bid shall be



- opened. The date and time of opening of the price bid along with names of successful tenderers in prequalification will be subsequently displayed in the notice board of Mines Department only and no individual communication to tenderers will be made.
- 4.3 VSP after opening of Tender / bid document may seek in writing documents / clarifications which are necessary for evaluation of tender / bid document from the tenderers / bidders or issuing authority for confirmation of eligibility / pre-qualifications stipulated in the NIT..
 - 4.4 Scope of work, Bill of Quantities (BOQ), Terms & Conditions given in the tender documents (placed in the website) are final. On verification, at any time, whether the tenderer is successful or not, if any of the documents submitted by the tenderer including the documents downloaded from our website / issued are found tampered / altered / incomplete, they are liable for actions like rejection of the tender, cancellation & termination of the contract, debarring, etc as per the rules of the Company.
 - 4.5 It will be presumed that the tenderers have gone through the General Conditions, Special Conditions & Instructions to tenderer, etc of the contract available in the website which shall be binding on him/them.
5. The tender documents and other details can be downloaded from our web site: www.vizagsteel.com and the same are to be submitted to DGM (Mines), Visakhapatnam Steel Plant .
 6. Non-transferable tender document can also be obtained from the Office of DGM (Mines), VSP on written request on bidder's letter head on payment of tender cost in the form of DD/BC during working hours 10 AM to 04.30 PM on or before **04.30 PM on 03.10.2016**
 7. Tenders will be received in the Office of DGM (Mines) **upto 03.00 PM on 04.10.2016** and Envelope-1 will be opened immediately thereafter.
 8. If it comes to the notice of VSP at any stage right from request for enlistment / tender document that any of the certificates / documents submitted by applicant for enlistment or by bidders are found to be false / fake / doctored, the party will be **debarred from participation in all VSP tenders for a period of 05 (five) years including termination of Contract**, if awarded. EMD / Security Deposit etc, if any, will be forfeited. The contracting Agency in such cases shall make good to VSP any loss or damage resulting from such termination. Contracts in operation anywhere in VSP will also be terminated with attendant fall-outs like forfeiture of E MD / Security Deposit, if any, and recovery of risk and cost charges, etc. Decision of VSP Management will be final and binding.
 9. Successful tenderer should be in a position to produce, after opening of the price bids, the Original Certificates in support of the attested copies of relevant documents submitted along with tender document. Failure to produce the original certificates at this stage in support of the attested copies of P.F Regn. / I TCC / Electrical License / experience / qualification any other documents, etc submitted earlier would result in **disqualification and forfeiture of EMD and also liable for debarring from participation in VSP tenders.**
 10. Tender documents will be issued to tenderers based on their request and on payment of tender cost or same can be downloaded from our web site by submitting the cost of tender along with their offer. However, RINL will not be responsible for any delay/loss/any website related problems in downloading the tender documents, etc. RINL reserve the right to (a) issue or Refuse tender documents without assigning any reason. (b) Split and award the work to more than one agency. (c) reject any or all the tenders or to accept any tender wholly or in part or drop the proposal of receiving tenders a any time without assigning any reason thereof and without being liable to refund the cost of tender documents thereupon.

DGM (Mines)I/c

Copy to:-

- | | |
|--|---|
| 1. Projects Contracts Department: | with request to please arrange for display in the notice board for publicity. |
| 2. Town Admn. Department | -do- |
| 3. Works Contracts Department | -do- |
| 4. Madharam Dolomite Mine (MDM), Madharam. | -do- |
| 5. Jaggayyapeta Limestone Mine (JLM), Jaggayyapeta | -do- |
| 6. Garbham Manganese Mine (GMM), Garbham. | -do- |
| 7. Mines Department Notice Board. | |



Ref. Tender No. : VSP/Mines-10/2016-17 Dt. 17.09.2016

NAME OF THE WORK: *Repair to BT road from VSP township to Oddugudem at Madharam Dolomite Mines.*

To

Deputy General Manager (Mines)I/c
Mines Department
Visakhapatnam Steel Plant
Visakhapatnam-530 031.
Sirs,

With reference to the Notice Inviting Tender, I/We have gone through the tender documents issued to us. I/We have also gone through the General Conditions of Contract of VSP available in VSP web site and noted the contents therein. I/We hereby confirm that I/We shall abide by Terms and Conditions of General Conditions of the Contract including Form of Tender, Invitation to Tender, Articles of Agreement etc. I/We hereby declare that, I/We have visited, inspected and examined the site and its surroundings and satisfied ourselves before submitting this tender, obtained information about the nature of work, facilities that may be required and obtained necessary information about Working Conditions, risk contingencies etc., which may influence this tender. We hereby offer to execute & maintain the work during the defect liability period in conformity with the tender conditions at the respective rates quoted by us.

I/We have deposited the EMD, which amount is not to bear any interest and I/We do hereby agree that this sum shall be forfeited by me/us if I/We revoke/withdraw/cancel my/our tender or if I/We vary any terms in our tender during the validity period of the tender without your written consent and/or if in the event of Visakhapatnam Steel Plant accepting my/our tender and I/We fail to deposit the required security money, execute the Agreement and/start the work within reasonable time (to be determined by the Engineer) after written acceptance of my/our Tender.

- Status of the firm (mark)
- Proprietary /Partnership/others (Specify)

* Authority to Sign:

- a) Proprietor
 - b) Managing Partner
 - c) Power of attorney holder
- Name of Partners:
- 1)
 - 2)
 - 3)

Yours faithfully,

Contractor)

(Signature of

Following Details are to be furnished by the tenderer compulsorily (neat & legible) while submitting the tender schedule	
Income Tax PAN No.	
Status/Reason for not having PAN No.	
OFFICIAL ADDRESS	
Phone No:	
Cell No :	
Fax No.:	
e-mail address:	

Name:.....



(1)

Rashtriya Ispat Nigam Limited
VISAKHAPATNAM STEEL PLANT

INSTRUCTIONS TO TENDERERS

1.0 GENERAL

- 1.1 Tenders in the prescribed form should be submitted in sealed envelope superscribed on the cover (i) Name of work and (ii) The due date of opening, (iii) Name of the Contractor, (iv) Tender notice number. Sealed tenders sent by the post should be addressed to DGM (Mines), Mines Department, C Block, II Floor, North Wing, Administrative Building, Visakhapatnam Steel Plant, Visakhapatnam – 530 031 clearly superscribed on the cover detailed as above.
- 1.2 Tender Documents issued are not transferable. Tender documents issued shall be submitted wholly without detaching any part.
- 1.3 Tenders shall be for the entire scope of the work mentioned in the tender documents.
- 1.4 Tenders shall quote “only the total amount in figures and in words”. Over writing is not permitted and corrections initialed. Amount quoted in words shall govern in case of variance between figures and words.
- 1.5 The “ Total amount quoted in figures and words shall be tallied” before submission of the tender and all mistakes corrected and initialed. Quotation shall preferably be type written or written in neat and legible hand writing. All the pages of tender documents shall be signed by the tenderer.
- 1.6 If by any reason, the tender receiving date happens to be VSP’s closed holiday or an extraordinary holiday the tender will be received on the following day at the same time and shall be opened immediately thereafter.
- 1.7 If by any reason the tender opening is postponed to any other date, the details will be displayed in the notice board of Mines department. Tenderers shall see the notice board regularly and keep themselves informed in this matter.
- 1.8 Before quoting, the tenderers shall necessarily contact the “Engineer” and fully understand the job, scope of works, unit of measurements, mode of measurements, scope of supply of materials by VSP, if any, working conditions, shut down arrangements, labour deployment requirements, risk contingencies, and such other factors which may affect their tender. The contractor should visit the site and acquaint himself with the site conditions before quoting for the work. He should also sign every page of the tender document in token thereof.
- 1.9 General conditions of contract of VSP (printed book) are available with concerned section in-charges at Visakhapatnam, Jaggayyapeta and Madharam for reference. The tenderers shall study and understand the same before quoting,
- 1.10 Tenders shall be kept open for acceptance for a period of 4 months from the date of opening of tender.

2.0 EARNEST MONEY DEPOSIT (EMD)

- 2.1 Earnest Money Deposit shall be in the form of Demand Draft (Drawn in favour of RINL/Visakhapatnam Steel Plant payable at Jaggayyapeta / Madharam depending upon the place of work to be executed) or a Bank Guarantee issued by a schedule Bank. Bank Guarantee and Demand Draft shall be valid for a period of three months from the tender opening date
- 2.2 Small Scale Industrial Units and Local Land Losers Contract Co-Operative societies who request for exemption from submission of EMD shall submit a copy of their Permanent Registration in a separate sealed cover stapled or attached with their sealed tender. Only such SSI Units Registered for the same trade/item for which the tender is relevant will be exempted from submission of EMD.



- 2.3 Bank Guarantees shall be submitted along with a covering letter in a sealed envelop directly from the Bank.
- 2.4 EMD's of unsuccessful tenderers will be refunded after reasonable time with out interest.

3.0 MODE OF SUBMISSION OF TENDER

- 3.1 The offer shall be submitted in 2(two) envelopes. FIRST ENVELOPE to be super-scribed as ENVELOPE-1 with name of work, name of the contractor, tender notice number should contain the cost of tender document in the form of DD as mentioned in the tender notice in case the tender is down-loaded from web-site (Tender can be purchased from the Office of DGM (Mines) by paying tender cost in the form of DD as mentioned in the tender notice in which case, tender cost need not be enclosed while submitting the tender. Earnest Money Deposit (EMD) separately in the form of DD/BC/BG/Certificate of SSI Unit registration to get exemption from EMD etc (Refer Para 2 above), and pre-qualification documents, criteria eligibility/experience and other relevant documents as mentioned in the tender notice.

SECOND ENVELOPE to be super-scribed as ENVELOPE-2 with name of work, name of the Contractor, tender notice number should contain price bid in its prescribed format along with the tender document.

These two separate covers shall be stapled / tied together and submitted.

- 3.2 The first cover(ENVELOPE-1) shall be opened initially and only on satisfying the eligibility criteria, adequacy of cost of tender document (in case of down-loaded tender), EMD etc., placed in it, the second cover (ENVELOPE-2) containing the price bid will be opened.
- 3.3 The date and time of opening of the price bid along with names of successful tenderers in pre-qualification will be subsequently displaced in the notice board of Mines Department only and no individual communication to tenderers will be made.
- 3.4 The documents submitted in the first envelope by the tenderers in respect of pre-qualification criteria are final and no further correspondence/clarifications/submission in this regard shall be entertained.
- 3.5 Scope of work, Bill of Quantities (BOQ), terms and conditions given in the tender documents (placed in the web site) are final. On verification at any time whether the tenderer is successful or not, if any of the documents submitted by the tenderer including the documents down-loaded from our web site/issued are found tampered/altered/incomplete, they are liable for action like rejection of the tender, cancellation and termination of Contract, debarring etc., as per rules of the Company.
- 3.6 The tender documents and other details can be down-loaded from our web site *www.vizagsteel.com* and the same are to be submitted.
- 3.7 Non-transferable tender document can also be obtained from the Office of the DGM (Mines), Mines Department, VSP on written request on bidders' letter head on payment of tender cost in the form of DD/BC as mentioned in the tender notice.

SIGNATURE OF THE CONTRACTER/TENDERER

4.0 INSTRUCTIONS FOR SUCCESSFUL TENDERS

- 4.1 Unqualified Acceptance.
- 4.2 Initial Security Deposit in the approved proforma/performance Guarantee Bond in lieu of Security Deposit in the approved proforma.
- 4.3 Non-Judicial stamp paper of value Rs.100/- for concluding agreement.
- 4.4 Permanent Account No allotted by Income Tax Department and copy of latest Income Tax clearance certificate.
- 4.5 Copy of Registered Partnership Deed or an affidavit of sole proprietorship
- 4.6 Copy of Power Attorney authorising the individual to sign the agreement
- 4.7 Copy of Registration Certificate under APGST
- 4.8 Copy of P.F.Registration Certificate.
- 4.9 Confirmation of Labour Management.
These documents shall be submitted not later than 15(fifteen) days from the date of issue of detailed Letter Of Indent (LOI)
- 5.0 Tenders will be opened in the presence of such tenderers or their authorised Representatives who choose to be Present.
- 6.0 RASHTRIYA ISPAT NIGAM LIMITED reserves the right to issue/refuse tender document and to accept/reject any or all tenders either in part or in full or to split up and award the work to more than one agency without assigning any reasons thereof and without any liability to RINL.
- 7.0 If it comes to the notice of VSP at any stage right from request for tender document that any of the certificates/document submitted by bidders are found to be false/fake/doctored, the party will be debarred from Participation in all VSP tenders for a period of 05 years including termination of contract, if awarded. EMD/ Security Deposit, etc if any will be forfeited. The contracting Agency in such cases shall make good to VSP any loss or damage resulting from such termination. Contracts in operation anywhere in VSP will also be terminated with attendant fall-outs like forfeiture of EMD/ Security Deposit, if any, and recovery of risk and cost charges, etc.

SIGNATURE OF THE CONTRACTER/TENDERER



Rashtriya Ispat Nigam Limited
VISAKHAPATNAM STEEL PLANT

CERTIFICATE

I/We have gone through the general conditions of contract of VSP and noted the contents therein. I/We hereby confirm that I/we shall abide by the terms and conditions of General Conditions of the Contract including Form of Tender, Invitation to Tender, Articles of Agreement etc I/We hereby declare that, I/We have visited, inspected and examined the site and its surroundings and satisfied ourselves before submitting this tender information about the nature of the work, facilities that may be required and obtained necessary information about working conditions, risk contingencies etc., which may influence this tender.

SIGNATURE OF THE TENDERER/CONTRACTOR



SPECIAL CONDITIONS OF CONTRACT (SCC)

1. General: The special conditions of the contract (SCC) are complementary to and shall be read in conjunction with General Conditions of Contract (GCC) of VSP for works contracts. Scope of work, Bill of Quantities and other documents forming part of the Tender Documents. In case of any conflict of meaning between SCC & GCC, provisions of SCC shall over ride the Provisions of GCC.
2. Visakhapatnam Steel Plant reserves the right to accept or reject the lowest or any other tender without assigning any reason and the work may be awarded to one of the Tenderers or to more than one tenderer.
3. The contract shall be treated as having been entered into from the date of issue of the letter of intent/work order to the successful tenderer, unless otherwise specified.
4. **WATER, POWER AND COMPRESSED AIR:** Unless otherwise specified to the contrary in the tender schedule, the contractor is entitled to use in the work such supplies of water, power and compressed air (Basing on availability) from VSP's sources from approved tapping points, free of cost. The contractor shall make his own arrangement for drawing the same to the work spot.
5. Immediately on receipt of work order, the successful tenderer shall obtain and submit the following documents to the Engineer with a copy to ZPE for start of work.
 - a(i) Insurance Policy covering all the workmen against injury, permanent disability, death, etc which shall be effective from the date of start of contract and cover for the entire period of contract including extension period, if any.
 - a(ii) Insurance policy for payment of ex-gratia amount of Rs.5,00,000/- (Rupees Five lakhs only) per head in case of fatal accidents while on duty, to the contract labour engaged by him in addition to the coverage under ESI scheme / Workmen Compensation insurance policy whichever is applicable. As and when a fatal accident takes place while on duty along with benefits under the ESI scheme / Workmen Compensation, whichever is applicable, the contractor is required to pay the ex-gratia amount within 30 days (thirty) days from the date of accident to the legal heir of the deceased. In case of any delay in paying the ex-gratia amount as above, the Employer has the right to pay such amount directly to the legal heir of the deceased and recover the same from the contractor's running / future bills. This insurance policy is to be taken by the contractor over and above the provisions specified under clause no. 6.13 (Third Party) and Workmen's compensation Insurance .
 - a(iii) Copy of the policy for third party insurance as stipulated in Clause 6.13 of the GCC.
 - b) Labour License obtained from Assistant Labour Commissioner (Central), Visakhapatnam as required.
 - c) PF Registration Certificate issued by PF Authorities
6. The contractor shall submit wage records, work commencement/completion certificate etc. and obtain necessary clearance from ZPE for bills clearance.
7. The contractor shall ensure strict compliance with provisions of the Employee's Provident Fund Act, 1952 and the scheme framed there under in so far as they are applicable to their establishment and agencies engaged by them. The contractor is also required to indemnify the employer against any loss or claim or penalties or damages whatsoever resulting out of non- compliance on the part of the contractor with the provisions of aforesaid act and the schemes framed there under. A copy of the provident fund membership certificate/PF CODE number shall be submitted by the contractor.
8. The contractor shall follow the provisions of Mines Act and all rules made there under from time to time as applicable and shall indemnify the employer against all claims of compensations under the provisions of the act in respect of workmen employed by the contractor in carrying out the work against all costs, expenses and penalties that may be incurred by the employer in connection therewith.
9.
 - a) Total amount quoted shall be inclusive of all taxes, levies, duties, royalties, overheads and the like but excluding service tax prevailing as on the date of submission of bids.
 - b) During the operation of the contract if any new taxes/duties/levies etc are imposed or rates undergo changes, as notified by the Government and become applicable to the subject works, the same shall be reimbursed by VSP on production of documentary evidence in respect of the payment of the same. Similarly benefits accruing to agency on account of withdrawal/reduction in any existing taxes and duties shall be passed on to VSP.

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- C) The benefit offered by the agency (other than Service Tax) will be deducted from each bill on the offered percentage basis. Amount so recovered shall be released, limiting to the percentage of benefit offered on the quoted price, only on receipt of credit by VSP.
- d) The prices are exclusive of Service Tax. RINL-VSP will pay Service Tax as applicable on submission of Invoices in accordance with Rule 4A(1) of Service Tax Rules 1994.
The contractor will be paid Service Tax by RINL-VSP along with monthly service charge bills for further deposit with Central Excise Authorities. The contractor will, in turn, submit the documentary evidence in support of payment of Service Tax of each month along with subsequent month RA bills.
10. **ADVANCE:** No advance of any sort will be given by VSP.
11. **PAYMENT TERMS:** Payment will be made monthly on recommendations of the Engineer basing on the quantities executed, at accepted rates.
12. **MEASUREMENTS:** The contractor shall take measurements jointly with the Engineer or his representative and keep joint records for the same. Bills shall be prepared and submitted by the contractor basing on agreed measurements.
13. **INITIAL SECURITY DEPOSIT (ISD):** Initial Security Deposit for the work shall be @ 2% of contract price. Earnest Money Deposited by the successful tenderer shall be adjusted against ISD, and the difference between ISD and EMD shall be deposited in the manner mentioned in the work order/letter of intent.
14. **RETENTION MONEY:** Retention Money for contracts up to a value of Rs. 100 lakhs, at the rate of **7.5% of the bills for works with defective liability period not NIL and at the rate of 5.0% for works with defective liability period "NIL"** will be deducted from each bill until this amount together with the Initial Security Deposit reach the limit of retention which is 7.5% or 5.0% as the case may be for the value of work. The Retention Money shall be released after the satisfactory completion of defect liability period after liquidating the defects. For contracts of value above Rs.100 Lakhs, the limit of retention money shall be Rs.7.5 lakhs plus 5% of the value exceeding Rs.100 lakhs.
15. **Security Deposit:** The Public Sector Enterprises or State/Central Government Undertakings/ SSI units registered with Govt. of AP/NSIC will not be required to submit Security Deposit, but however they shall submit **"Performance Guarantee Bond"** in lieu of Security Deposit in the prescribed proforma equivalent to the value of Security Deposit covering the period of contract + defect liability period + 6 months (Claim period).
16. Recovery of income tax at source will be made from contractor's bill and deposited with Income Tax Department as per rules. Recovery of sales tax applicable shall be made from the contractor's bills.
17. **SAFETY:**
- a) The contractor and his workers must strictly take all safety precautions and shall supply to his workers dependable safety appliances like hand gloves, safety boots, safety belt, safety helmets, duster cloth, dust mask/nostril filter etc. In addition to this, contractor shall also provide additional safety appliances as per requirement and follow safe working practices like using fully insulated electrode holders etc. He shall also ensure that his workmen intelligently use only dependable safety appliances supplied to them.
 - b) The contractor shall take adequate safety precaution to prevent accidents at site. The contractor shall also ensure that his employees observe the statutory safety rules and regulations and also those laid down by the employer from time to time and promptly submit report of accident and state the measures taken by him to prevent their recurrence and also keep the employer indemnified of all claims arising out of such accidents.
 - c) No Workmen shall be engaged on the work without proper safety induction and without using required PPE. Use of safety helmet and shoe is must excepting in painting works where shoe will not be used.
 - d) All the safety appliances required for safe working as decided by SED/Contract operating deptt. shall be provided by the contractor to his workmen.
 - e) Clearance to start the job will be obtained by the contractor in form 'A&B' before start of work. The forms may be obtained from the dept. concerned.
 - f) Works at height cannot be started without clearance from Zonal Safety Officer. The workers engaged for work at height shall possess height pass from SED. The names of workmen working at height or in hazardous areas will be written on the body of form "B".

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- g) The contractor shall ensure that the Welders and Gas Cutters wear cotton dress and leather apron. They shall not wear nylon/synthetic dress. This is required to avoid any fire accident. This must be followed strictly”.
- h) Contravention of any safety regulation of VSP in vogue from time to time will result into work stoppage, levying penalties and ultimately in contract termination.. The list of safety violations category wise are as follows:

Category	Safety violations	Fine
I	<p>1. Occasional violation of not wearing crash helmet.</p> <p>2..Driver of two wheeler carrying more than one pinion rider</p> <p>3.Wrong Parking of vehicle.</p>	<p>First offence: Rs. 100.00 Second or subsequent offences: Rs.300.00</p> <p>First offence: Rs. 100.00 Second or subsequent offences: Rs.300.00</p> <p>First offence: Rs. 100.00 Second or subsequent offences: Rs.300.00</p>
II	<p style="text-align: center;"><u>MINOR VIOLATIONS</u></p> <ol style="list-style-type: none"> 1. Working at height with out height pass. 2. Unauthorized entry at hazardous location. 3. Engaging workers with out safety training. 4. Proper ladder/steps not provided for working. 5. Faillure to provide proper Shuttering at excavation works. 6. Power connection taken from board without proper board plug. 7. Fitness certificated of cranes/hydra/heavy vehicles not available. 8. Crane rope conditions not ok. 9. Not wearing safety helmet /safety shoe at site. 10. Safety goggles/Hand gloves not used. 11. Gas cutting without goggle. 12. Rolling/lifting of cylinder/dragging on the ground (without cage). 13. Welding with non standard holder. 14. Welding machine earthing not done (double body earthing). 15. Gas Hose pipe clamping done by wires. 16. LPG. Cylinder date expiry/over. 17. Loading/unloading of cylinder –cushion not given. 18. Condition of hose pipe not good. 19. Working with leaking cylinder. 20. Using non power cable instead of welding cable. 21. Working without work permit/shut down. 22. Not putting red flags / stoppers. 23. Dismantling of structure without authorized plan. 24. Unauthorized Oxygen /nitrogen tapping. 25. Not having proper gate passes/other area passes. 26. Use of damaged slings/tools/ropes. 27. Use of Hand grinders/mixer machines without guard. 28. Not reporting of accident. 29. Taking shelter behind electrical panel. 	<p>First Violation: Rs.2,500/- Second violations : Rs.10,000/- Third time repeated violation: Rs 20,000/-</p>

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	30. Driving of heavy vehicles on the main road during restricted hour. 31. Truck side panel/broken not ok. 32. Dropping / Spillage of material on the road. 33. No number plate on vehicle. 34. No indicator light / brake light on vehicles. 35. Driving Dangerously 36. Overloading of the vehicles beyond CC weight. 37. Racing and trials of speed, Overtaking heavy vehicles 38. Moving vehicles in unauthorized restricted routes 39. Talking with cell phone while driving 40. Truck carrying Powdery material with out tarpaulin 41. Vehicles without Red flags/Red lights ,Side guards & Donnage. 42. Stock protruding out of the truck body.	First Violation: Rs.2,500/- Second violations : Rs.10,000/- Third time repeated violation: Rs 20,000/-
III	<u>MAJOR VIOLATIONS</u> 1. Using bamboo or other non standard material for scaffolding. 2. Railing not given at platforms or opening of floor. 3. Scaffolding planks not tied properly. 4. Throwing / dropping of material from height. 5. Proper ladder/approach not given for working at height. 6. Walkway / cross over path not provided. 7. No barricading of excavated pits. 8. No top cover on power distribution board 9. Sleeping under truck. 10. Absence of Supervisor at height works, confined space jobs and other hazardous jobs. 11. Welding screen /Face shield ,welder gloves not used 12. Driving vehicles without Valid driving license. 13. Driving by an Drunken person	Rs. 7,500/- for 1 st violation, 2 nd and subsequent violations Rs.15000/-
IV	<u>HIGH RISK VIOLATIONS</u> 1. Failure to use Full body harness with double lanyard. 2. Life line of Full body harness not anchored. 3. Floor opening left unguarded in the area of work. 4. Working at roof without daily permit. 5. Working in confined space with out confined space work permit. 6. Violation of electrical shut down/PTW 7. Violation of HOT work permit system	Rs.15,000/-
V	1. Serious injuries and permanent disabilities 2. Fatal Accident Cases	Rs 100000 or 2.5% of contract value Whichever is less. Rs2,,00,000/- Or 10% of contract value whichever is lower.

- 1) The above penalties related to the accidents mentioned at Cat (V) will be imposed on agency in case the reasons to the accidents are attributable to the agency.

- 2) Independent of the above, the contractor shall be debarred or deregistered from taking up further contractual work in VSP in case any repeated fatal accident after 3rd incident for the reasons attributable to contractor.

(Note: The penalties mentioned above are in addition to those which are applicable as per the statutory acts & rules . In case of any imposed penalty by any statutory authority, the same shall be over and above the contractual clauses.)

- 3) Without prejudice to the right conferred by the clause No.16(g) of Special conditions of Contract for stoppage of work for violation of safety rules ,the contractor shall be liable for penalty at the rates indicated in Annexure depending upon the category of violation.
- 4) Operating authority will assess the penalty amount having regard to all the circumstances in particular the nature and gravity of the violation on the advice of Head of the Safety Engineering Department and will issue a show-cause notice specifying there in the proposed penalty . Considering the cause shown by the contractor , if any , the operating authority shall pass final orders which shall then be binding on the contractor. The penalty amount shall be recoverable from any bill and / or EMD / SD of the contractor without any further reference to him.

18. SHUTDOWNS:

- A) Necessary shutdowns will be arranged by VSP to the contractor for carrying out the work based on requirement. No claims on account of delayed/prolonged shutdown will be entertained.
- B) The works assigned to the contractor by the Engineer from time to time shall be completed within the time schedule fixed by the Engineer in each case, within the approved shut down period.

19. LABOUR DEPLOYMENT:

- A) The contractor shall deploy his labour as per requirement and as instructed by the Engineer. It may be necessary to carry out the work round the clock based on requirement and shutdown provided. The contractor's rate shall cover such eventualities.
- B) Only trained, experienced, safety inducted workers acceptable to the Engineer shall be engaged on this work, work shall be executed as per specifications to the satisfaction of the Engineer.

20. **SECURITY REGULATIONS:** The contractor shall abide by and also observe all security regulations promulgated from time to time by the employer.

21. **STORING/STACKING OF MATERIALS:** Storing/Stacking/Placing of materials shall be only at the places designated by the engineer.

22. The contractor, his supervisors and workmen shall observe entry and exit timings strictly.

23. After completion of work activity, the site has to be cleared of all debris, construction material and the like.

24. The successful tenderer shall start the work immediately after obtaining gate passes and safety induction training and clearance from the Employer.

25. **NOTICES:** Any notice to be given to the contractor under terms of the contract shall be considered duly served, if the same has been delivered to, left for or posted by registered post to the contractors principal place of business (or in the event of the contractor being a company, its registered office), at the site or to their last known address.

26. **DEFAULT BY TENDERERS:** The successful tenderer may be debarred at the discretion of the company, from issue of further tender documents, work orders etc., for a specified period to be decided by the employer in case of :
“Undue delay in starting and execution of work awarded, poor performance, backing out from the tender, non accepting work order/LOI during the validity of tender or non observance of safety rules and regulations, misappropriation of company's materials/property, non payment of due wages to labour or such similar defaults”.

27. Successful tenderer should be in a position to produce the Original Certificate in support of the attested copies of relevant documents enclosed along with pre-qualification documents or afterwards, after opening of the Price Bids.

28. Failure to produce the original certificates at this stage in support of the attested copies of PF Registration/ITCC/Electrical License/Experience/Qualification any other documents etc., submitted earlier would result in disqualification and forfeiture of EMD and also liable for debarring from participation in VSP tenders.

29. If it comes to the notice of VSP at any stage right from request for registration/tender document that any of the certificates/documents submitted by applicant for registration or by bidders are found to be false/fake/doctored, the party will be debarred from participation in all VSP tenders for a period of 05 (FIVE) YEARS including termination of Contract, if awarded. EMD / Security Deposit etc., if any, will be forfeited. The Contracting Agency in such cases shall make good to VSP any loss or damage resulting from such termination. Contracts in operation any where in VSP will also be terminated with attendant fall outs like forfeiture of E.M.D. / Security Deposit, if any, and recovery of risk and cost charges etc. Decision of V.S.P. Management will be final and binding.
30. Failure to execute the work after LOI/WORK ORDER is given, will make the party liable for debarring for a period of 2 (TWO) YEARS.
31. In case it is found before/after award of work to the person/agency through Limited Tender Enquiry (LTE) that the same person/agency is proprietor/proprietress/partner of two or more separate agencies and quoted for the same work, then punitive action to the extent of debarring up to 02 (Two) years from participating in VSP tenders will be taken.
32. Contractor shall note that:
- i) Time for mobilization after issue of FAX Letter of Intent/detailed Letter of Intent / Work Order shall be;
 - a. 03 (Three) days for Capital Repairs
 - b. 15 days for Civil Works
 - c. 60 days for painting works of Structural Engineering Department
 - d. 07 (Seven) days for Annual Mechanical, Electrical and works of technological assistance/cleaning.
 - ii) Re-starting the work after disruption shall be within 04 (Four) to 06 (Six) hours after the cause of disruption is removed as decided by the HOD.
 - iii) Notice period for Contract Termination shall be - 03 (Three) hours in the event of breakdowns, 02 (Two) days in Capital Repairs and 10 days in other works.
- Failure to adhere to above stipulations may result in Termination of contract at risk & cost and will make the party liable for debarring for a period o 2 (Two) years.*
33. In case the tenderers revoke / withdraw / cancel their tender or they vary any terms of their tender during the validity period of the tender without the written consent of Visakhapatnam Steel Plant (VSP) or in the event of VSP accepting their tender and fail to deposit the required security money, execute the Agreement and fail to start the work within reasonable time (to be determined by the Engineer) after written acceptance of their tender – EMD submitted by them will be forfeited by VSP.
34. Agencies are required to submit Bank Guarantee for the value as decided by the Engineer as a Security while taking out Equipment/Components/materials of VSP to their workshop situated outside the VSP premises for carrying out repairs.
35. In case of any statutory revision in the minimum wages payable to contract workmen as notified by the Regional Labour Commissioner (Central), Hyderabad, Escalation shall be paid as per the following formula :

$$V = \frac{L \times W \times (X - X_o)}{X_o}$$

WHERE :

- V = Escalation payable
- L = **Labour content** during billing period .
- W = Gross value of work done on the basis of Contract rates for the period for which variation is applicable.
- X = Revised Weighted Average of RINL / VSP approved rates for the period for which variation is applicable (for Unskilled, Semi-skilled and Skilled categories of Workers) based on the minimum wages as notified by the Regional Labour Commissioner (Central), Hyderabad for the period under consideration for that contract as per present man days of different categories for the billing period.
- Xo = Existing (on the basis which tender estimate is prepared) Weighted Average of existing RINL / VSP approved rates (for unskilled , semi skilled and skilled categories of workers and which is based on the minimum wages notified by Com missioner of Labour, Government of Andhra



Pradesh, Hyderabad)for that contract as per present man days of different categories for the billing period.

WHERE

$$\begin{aligned} X &= (a \times \text{USR} + b \times \text{SSR} + c \times \text{SKR}) / (a + b + c) \\ X_o &= (a \times \text{USRo} + b \times \text{SSRo} + c \times \text{SKRo}) / (a+b+c) \\ L &= (a \times \text{USRo} + b \times \text{SSRo} + c \times \text{SKRo}) / W \end{aligned}$$

WHERE

a = Man days present by USW during the Billing period
b = Man days present by SSW during the Billing period
c = Man days present by SKW during the Billing period
USR = Revised RINL / VSP approved estimated wage rate of USW at the time of Billing
SSR = Revised RINL / VSP approved estimated wage rate of SSW at the time of Billing
SKR = Revised RINL / VSP approved estimated wage rate of SKW at the time of Billing
USRo = RINL/VSP estimated wage rates of USW based on which the estimate of work is prepared
SSRo = RINL/VSP estimated wage rates of SSW based on which the estimate of work is prepared
SKRo = RINL/VSP estimated wage rates of SKW based on which the estimate of work is prepared

(The above escalation shall be independent of the award percentage whether +ve or –ve.)

36.1

PAYMENT OF MINIMUM WAGES: Wages paid to the Workmen by the Contractor should not be less than the rates notified by the **Regional Labour Commissioner (Central), Hyderabad,** A P. from time to time with regard to Minimum Wages applicable to the respective categories of Workmen plus the Adhoc amount at the rate of Rs.11.54 as per working day per Workman per category. **Wages with ad-hoc amount** to the workmen should be paid on or before the 7th of the subsequent month. if 7th falls on a holiday or weekly off day, the payment should be made one day prior to that. Payment of PF for the month, both the employer's (in this case contractor) and employee's (in this case workman employed by the contractor) contributions should be deposited in the bank in the permanent PF code number and challan obtained before the 15th of the subsequent month and forwarded to the Engineer". In case of failure of the contractor to comply with any of the above, the following action will be taken by VSP.

LAPSE	ACTION BY VSP
1. a) Payment of wages at rates less than those notified under the minimum wages.	a) An amount equivalent to the differential amount between wages to be paid under minimum wages notification of the Govt. applicable for the period less actual wages paid shall be recovered from the bills as certified by the Engineer.
b) Non-payment of ad-hoc amount	b) As amount equivalent to actual payable towards ad-hoc amount to the workmen engaged for relevant period shall be recovered from the bills as certified by the Engineer.
2. Non payment of wages	An amount equivalent to wages payable by the contractor applicable for the relevant period shall be recovered from the bills as certified by the Engineer.
3. Non Payment of PF	Recovery of PF amount and an amount equivalent to maximum penalty leviable by Regional Provident Fund Commissioner for the delayed period under the provisions of EPF & MP Act and Rules for delayed remittance of PF contributions (both the employee's and employer's contribution), shall be recovered from

4. Delayed Payment of PF	<p>I the bills of contractor as certified by Engineer.</p> <p>An amount equivalent to maximum penalty leviable by Regional provident Fund Commissioner for the delayed period under the provisions of EPF & MP Act and rules for delayed remittance of PF contributions (both the employee's and employer's contribution), shall be recovered from the bills of the contractor as certified by Engineer.</p>
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37. The contract period can be extended at the discretion of V.S.P. up to 04 (Four) months at the existing Rates, Terms and conditions and the Contractor shall be bound to execute the work accordingly and the offer of the Contractor is deemed to include this aspect.
38. The tenderers shall note that in case of quoting above the Estimated Value of V.S.P. the L-1 party shall furnish logical / satisfactory explanation which V.S.P. may seek if felt necessary for quoting such high rates. If the explanation offered by the L-1 party is not acceptable to V.S.P., the L-1 party may be recommended for disqualification while retendering the work.
39. The contractor should clearly understand and comply with the Mines Act and relieve the FEMALE WORKERS from their work site within the restricted working hours prescribed therein the Act.
40. The following deductions per Workman deployed category-wise shall be made from the bills / amounts due to the Contractor as applicable for the work done and such deducted amounts shall be released as below :

S.No.	Component	Recovery amount per Labour per every WORKING DAY (in Rupees)			To be released when
		UN- SKILLED	SEMI- SKILLED	SKILLED	
01	Notice pay	25.23	28.57	33.47	After the Contractor makes payment to the workmen in the presence of <i>Engineer I/c</i> and <i>CLC representatives</i> . A certificate to this effect is to be enclosed with pre-final bill. (to be paid with pre-final bill)
02	Retrenchment compensation	12.61	14.29	16.73	
03	Leave with wages	15.52	17.58	20.59	
Sub-total		53.36	60.44	70.79	
04	Bonus	11.55	11.55	11.55	After the Contractor makes payment to the workmen in the presence of <i>Engineer I/c</i> and <i>CLC representatives</i> . A certificate to this effect is to be enclosed with RA bill / pre-final bill. (to be paid with RA bill / pre-final bill as and when paid by the Contractor)
Grand total (To be paid to the Labourer)		64.91	71.99	82.34	
10% toward profit and overheads of Contractor		6.49	7.20	8.23	
Total recovery amount		71.40	79.19	90.57	

NOTE

- i *The above recovery rates are effective from 01.10.2015. In case of any statutory revision in minimum wages payable to contract workmen as notified by the Regional Labour Commissioner (Central), Hyderabad from time to time, the above recovery amounts for workmen category-wise will be revised by RINL / VSP and will be notified accordingly.*

ii *Payment against the above components is to be made to the workmen based on effective wages of last drawn pay.*

41. **CLAUSES CONCERNING CENVAT AGAINST EXCISE DUTY:**

- a) The tenderer shall specify the percentage of CENVAT benefit on quoted price for which they shall furnish the duty paying documents.
- b) The successful tenderer shall take necessary steps to comply with the rules and provisions of central excise and service tax law facilitating VSP to avail CENVAT credit.
- c) The amount of CENVAT benefit declared shall be deducted from the tendered price for the purpose of tender evaluation i.e. the evaluation shall be on the net of CENVAT benefit.
- d) The invoice raised by the Contractor should clearly mention VSP as the consignee (Consignee: RINL, VSP, A/c: Name of the contractor). It should be ensured that material has been delivered along with the duplicate for transporter copy of the invoice, based on which CENVAT credit is to be claimed.
- e) The duty paying documents shall be submitted as soon as the material is procured by the agency for incorporation in the work. The CENVAT benefit offered by the agency will be deducted from each bill on the offered percentage basis and will be released to the extent CENVAT benefit could be availed by VSP. The contractor shall extend all possible help to facilitate VSP to avail CENVAT benefit. If CENVAT benefit could not be availed by VSP due to reasons attributable to the contractor, such amount will not be released by VSP.
- f) In the event the CENVAT benefit realized by VSP (based on documents) is in excess of the CENVAT benefit offered by the agency/contractor, the refund will be restricted to the benefit offered by the agency. The excess amount realized from Excise Authorities will be to the credit of VSP only.
- g) Material once received in to the factory would not be allowed to go outside the factory premises for any reason. Excess/Rejected material will be allowed to be taken back after complying with the provisions of CE Act.

42. The successful tenderer shall produce VAT Registration Certificate under APVAT Act, wherever applicable, before signing the Work Order / LOA and submit a copy of the same.

43. RINL reserves the right to reject the offers of tenderers whose performance is poor in awarded / ongoing works if any.



VISAKHAPATNAM STEEL PLANT

SPECIFICATION FOR ROAD AND PAVING WORKS

1.0 SCOPE:

The scope of work under this contract covers the maintenance of Roads and Drains inside the plant area, complete in all respects as shown in the drawings (if any) and as indicated in the specifications and BOQ.

2.0 GENERAL:

The work shall conform to the "Specification for road and bridge work" published by the Indian Road Congress (IRC) on behalf of the Govt. of India, Ministry of Surface Transport (Road Wing), New Delhi.

2.1 Earth work:

2.1.1 Preparation of Cut formation:

The Section to be constructed shall be excavated or formed to levels shown on the drawings. The bottom of the excavation shall be compacted as specified and the bottom and size checked for conformance to drawings in respect of cross-section and Gradient with a scratch template moving over guides located suitably. The template shall have points placed not more than 200 mm apart and shall be an exact elevation of the cross section. All high points shall be removed and low areas backfilled after scarifying and providing proper bond. The surface shall be rolled with 8 to 10 ton power roller to attain the specified Compaction. Haulage of materials over the formed surface shall not be permitted.

The sub-grade shall comply with the following requirements:

- a) No soft spots shall be present;
- b) It shall be properly drained during construction;
- c) The minimum compaction at sub-grade level shall be not less than 100% of maximum Laboratory dry density as per IS:2720 (Part - VII).

Where the material in the sub-grade (that is within 0.5 Metre of the lowest part of the pavement) has a density less than 100% of the maximum dry density determined according to IS:2720 (Part-VII), the same shall be loosened to a depth of 500 mm and Compacted in 250 mm thick loose layers in accordance with the requirements of Clause 2.1.3. Any unsuitable material encountered at the formation level shall be removed to a depth indicated by the Engineer and replaced with suitable material compacted in accordance with Clause 2.1.3. In rocky formations, the surface irregularities shall be corrected and the levels brought up to the specified elevation with sub-base or base material as directed by the Engineer, laid and compacted in accordance with the respective specifications for these materials.

2.1.2 Formation of shoulders:

To confine the aggregates laterally, the side shoulders graded to the required cross-section, watering and rolling it in a single layer with a power roller.

Construction of WBM in a trench section excavated in the finished formation must be avoided.

2.1.3 Embankment and sub-grade construction:

2.1.3.1 Description:

These specifications shall apply to the construction of embankments, sub-grades, earthen shoulders and miscellaneous back fills with approved materials obtained either from excavation for road construction, borrow pits or other sources. All embankments and sub-grades shall be constructed in accordance with the requirements of these specifications and in conformity with the lines, grades and cross sections shown on the drawings or as directed by the Engineer.

2.1.3.2 Definition

For the purposes of these specifications the top 500 mm of the road embankment over the entire formation width and directly supporting the road pavement will be termed as sub-grade.

2.1.3.3 Materials

2.1.3.3.1 Physical Requirements:

The materials used in embankment and sub-grades shall be earth, moorum, gravel, a mixture of these or any other materials approved by the Engineer. Such materials shall be free of logs, stumps, roots, rubbish or any other ingredient likely to deteriorate or affect the stability of the embankment/subgrade.

The following types of material may be considered unsuitable for embankment:

- a) Material from swamps, marshes or bogs.
- b) Peat, log, stump or perishable material.
- c) Material susceptible or spontaneous combustion
- d) Material in a frozen condition
- e) Clay of liquid limit exceeding 80 and plasticity index exceeding 55.

The work shall be so planned and executed that the best available materials are saved for the sub grade and the embankment portion just below the sub grade.

The size of the coarse material in the mixture of earth shall ordinarily not exceed 75 mm when being placed in the embankment and 60 mm when placed in the sub-grade. However, the Engineer may at his discretion permit the use of material coarser than this also if he is satisfied that the same will not present Any difficulty as regards the placement of fill material and its compaction to the requirements of these specifications.

Ordinarily, only the materials satisfying the density requirements given in Table 1 shall be employed for the construction of the embankment and the sub-grade.

TABLE-1

SNo	TYPE OF WORK	MAXIMUM LABORATORY DRY DENSITY WHEN
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		TESTED AS PER (IS:2720(Part-VII))
01	Embankments upto 3 Metre height.	Not less than 1.44 gm/cc
02	Embankments exceeding 3 Metre height or embankments of any height subject to long periods of inundation.	Not less than 1.52 gm./cc
03	Subgrade and earthen shoulders verge	Not less than 1.65 gm/cc

The Engineer may, however, relax these requirements at his discretion taking into account the availability of materials for construction and other relevant factors.

Highly expansive clays, exhibiting marked swell and shrinkage properties shall not be used in the subgrade. Where allowed these shall be deposited only in the bottom layers of the embankment and shall not be permitted in the top 500 mm portion of the embankment just below the subgrade.

2.1.3.4 Stripping and storing top soil: In localities where most of the available embankment materials are no conducive to plant growth, or when so directed by the Engineer the top soil existing over the embankment foundation shall be stripped to specified depths not exceeding 150 mm and stored for covering embankment slopes and other disturbed areas where re-vegetation is desired.

2.1.3.5 Compacting group supporting embankment:

In all cases, the original ground shall be consolidated by rolling, as directed by Engineer, but with a maximum of six passes of 8-10 tonnes roller.

In a case where there is no embankment and only the sub grade is to be constructed above the original ground and the original ground does not already have a relative compaction of at least 100%, the same shall be loosened to a depth of 500 mm, watered and compacted in layers not exceeding 250 mm in loose thickness to the maximum dry density of the material determined in accordance with IS:2720 (Pt.VII). However, before relaying and compacting the loosened material, the surface below this level shall be suitably consolidated as directed by the Engineer but with a maximum of six passes of a 8-10 tonne roller.

Where so directed by the Engineer any unsuitable material Occurring in the embankment foundation shall be removed and replaced by approved materials suitably compacted.

Embankment or sub grade work shall not proceed until the foundations for embankment/sub grade have been inspected by the Engineer for satisfactory condition and approved.

2.1.3.6 Spreading material in layers and bringing to appropriate moisture content:

The embankment and subgrade material shall be spread in a uniform thickness over the entire width of the embankment in layers not exceeding 250 mm in loose thickness. Succession layers shall not be placed until the layer under construction has been thoroughly compacted to the requirement set down hereunder.

Moisture content of the material shall be checked at the source of supply and if found less than the specified for compaction, the same shall be made good either at the source or after spreading the soil in loose thickness for compaction. Where water is required to be

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added in such constructions, water shall be sprinkled from a hose pipe and/or a truck mounted water-tank capable of applying water uniformly and at controlled quantities to variable widths of surface but without any flooding.

If the material delivered to the road bed is too wet, it shall be dried, by aeration and exposer to the sun, till the moisture content is acceptable for compaction. Should circumstances arise, where owing to wet weather, the moisture content cannot be reduced to the required amount by the above procedure, work on compaction shall be suspended.

Moisture content of each layer of soil shall be checked in accordance with IS:2720 (Part-II) and unless otherwise mentioned, shall be so adjusted, making due allowance for evaporation losses, that at the time of compaction it is in the range of 1 percent above to 2 percent below the optimum moisture content determined in accordance with IS:2720 (Part-VII). Highly expansive clays shall, however, be compacted at 2 to 4 percent above the optimum moisture content.

2.1.3.7 **Compaction:**

Only the compaction equipment approved by the Engineer shall be employed to compact the different material types encountered during construction. Smooth-wheeled, vibratory, pneumatic. Sheep's foot rollers, etc. of suitable size and capacity as approved by the Engineer shall be used for the different types and grades of materials required to be compacted either individually or in suitable combinations. If directed by the Engineer, the contractor shall demonstrate the efficiency of the equipment he intends to use by carrying out compaction trials. Each layer of the material shall be thoroughly compacted to the densities specified in Table given below. Subsequent layers shall be placed only after the finished layer has been tested.

TABLE-2
COMPACTION REQUIREMENTS FOR EMBANKMENT AND SUBGRADE

SNO	TYPE OF WORK/MATERIAL	FIELD DRY OF DENSITY AS PERCENTAGE OF MAXIMUM LAB. DRY DENSITY AS PER IS:2720 (PART-VII).
1	Subgrade and (earthen shoulders verge)	Not less than 100
2	Embankment	Not less than 95
3	Highly expansive clays	85 to 90

When density measurements reveal any soft areas in the embankment/subgrade earthen shoulder (verge), further compaction shall be carried out as directed by the Engineer. In spite of that, the specified compaction is not achieved, the material in the soft areas shall be removed and replaced by approved material, compacted to the density requirements and satisfaction of the Engineer.

2.1.3.8 **Drainage:**

The surface of the embankment/subgrade at all times during construction shall be maintained at such a cross fall (not flatter than that required, for effective drainage of an earthen surface) as will shed water and prevent pounding.

2.1.3.9 **Kerb Stones:**

These shall be laid to proper alignment and level with sufficient anchorage in the soil carriage way.

SUB-BASES, BASES(NON-BITUMINOUS) AND SHOULDERS

2.2 **GRANULAR SUB-BASE**

2.2.1 **SCOPE:**

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This work shall consist of laying and compacting well graded material on prepared sub grade in accordance with the requirements of these specifications. The material shall be laid in one or more layers as sub base or lower sub base and upper sub base (termed as sub base hereinafter) as necessary according to lines, grades and cross sections shown on the drawings or as directed by the Engineer.

2.2.2

MATERIALS:

The material to be used for the work shall be natural sand, moorum, gravel, crushed stone, crushed slag, crushed concrete, brick metal, literate, kankar etc. or combinations thereof depending upon the grading required. The mixed material shall be free from organic or other deleterious constituents and conform to one of the three grading given in Table mentioned below:

TABLE -3
GRADING FOR GRANULAR SUBBASE MATERIALS

SIEVE DESIGNATION	PERCENT BY WEIGHT PASSING THE SIEVE		
	Grading-1	Grading 2	Grading - 3
90 mm	100	100	100
63 mm	90 - 100	90 - 100	90 - 100
5.6 mm	38 - 72	44 - 91	58 - 100
75 micron	0 - 20	0 - 25	0 - 30
CBR VALUE (Minimum)*	30 percent	25 percent	20 percent

Note: The material passing 425 micron sieve for all the three gradings when tested according to IS:2720 (Part-V) shall have liquid limit and plasticity index of not more than 25 percent and 6 percent respectively.

* The material for lower sub-base may have a minimum CBR value of 10

2.2.2.1

Physical requirements:

The fraction of material passing 22.4 mm sieve shall give a CBR value as specified in the above table or more as specified in the contract, when tested in accordance with IS:2720 Part XVI) after preparing the samples at maximum dry density and optimum moisture content corresponding to IS:2720 (Part-VII) and soaking the same in water for 4 days.

2.2.3

Construction Operations:

2.2.3.1

Preparation of sub-grade :

Immediately prior to the laying of sub-base, the subgrade already finished to clause 2.1 or 2.1.3 as applicable shall be prepared by removing all vegetation and other extraneous matter, lightly sprinkled with water if necessary and rolled with one pass of 8-10 tonne smooth wheeled roller.

2.2.3.2

Spreading and compacting:

The subbase material of grading specified in the contract shall be spread on the prepared subgrade with the help of motor grader of adequate capacity, its blade having hydraulic controls suitable for initial adjustment and maintain the required slope and grade during the operation or other means as approved by the Engineer. The thickness of loose layers shall be so regulated that the maximum thickness of the layer after consolidation does not exceed 150 mm.

Moisture content of the loose material shall be checked in accordance with IS:2720 (Part-II) and suitably adjusted by sprinkling additional water from a truck mounted or trailer mounted water tank and suitable for applying water uniformly and at controlled quantities to variable widths of surface or other means approved by the Engineer so that at the time of

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compaction it is from 1 percent above to 2 percent below the optimum moisture content corresponding to IS:2720 (Part-VII). While adding water due allowance shall be made for evaporation losses. After water has been added, the material shall be processed by mechanical or other approved means if so direct by the Engineer until the layer is uniformly wet.

Immediately thereafter, rolling shall be started with 8 to 10 tonne smooth wheeled roller or other approved equipment. Rolling shall commence at the edges and progress towards the center longitudinally except that on super elevated portions it shall progress from the lower to the upper edge parallel to the center line of the pavement. Each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. During rolling, the grade and cross fall (camber) shall be checked and any high spots or depressions which become apparent corrected by removing or adding fresh material.

Rolling shall be continued till the density achieved is at least 100 percent of the maximum dry density for the material determined as per IS:2720 (Part-VII). The surface of any layer of material on completion of compaction shall be well closed, free from movement under compaction equipment and from compaction planes, ridges, cracks or loose material. All loose segregated or otherwise defective areas shall be made good to the full thickness of layer and re-compacted.

2.2.4

Granular sub-base: (With granulated BF slag and moorum)

The material recommended for subbase layers is gravel mixed with Granulated Blast Furnace Slag(GBFS) by weight. The requisite quantities of materials shall be spread over the prepared sub-grade and thoroughly mixed preferably by using mechanical mixers like "rotillor" and compacted in layers with compacted thickness of 150 mm each layer with optimum moisture content to 100 percent of the maximum laboratory density as per IS:2720 (Part-VII).

The gravel from approved quarry is to be collected and the gravel GBFS are to be mixed as per the grading shown in table below and the materials will be used in the lower layers of roads.

The mixed material shall be free from organic or other deleterious constituents and conform to one of the three gradings as given below:

TABLE-4
GRADING FOR GRANULAR SUB-BASE MATERIALS

Sieve Designation	Percent by Weight passing the Sieve		
	Grading-1	Grading-2	Grading-3
80 mm	100	100	100
63 mm	90 - 100	90 - 100	90 - 100
4.75 mm	35 - 70	40 - 90	50- 100
75 micron	0 - 20	0 - 25	0 - 30
CBR VALUE (MINIMUM)	30%	25%	20%

NOTE: The material passing 425 micron sieve for all the three gradings when tested according to IS:2720 (Part-V) shall have liquid limit and plasticity Index of not more than 25 percent and 6 percent respectively

- 2.2.5: **Physical requirements:**
The fraction of material passing 22.4 mm sieve shall give a CBR value as specified in the above table or more as specified in contract when tested in accordance with IS:2720 (Part XVI) after preparing the samples at maximum dry density and optimum moisture content corresponding to IS:2720 (Part-VII) and soaking the same in water for 4 days.
- 2.2.6 **Construction Operations:**
- 2.2.6.1. **Preparation of subgrade:** Clause 2.2.3.1 shall apply.
- 2.2.6.2. **Spreading and compacting:** Clause 2.2.3.2. shall apply.
- 2.3. **WATER BOUND MACADAM SUB-BASE/BASE COURSE:**
- 2.3.1 **Scope:**
- 2.3.1.1. This work shall consist of clean, crushed aggregates mechanically interlocked by rolling and bonded together with screening, binding material where necessary and water laid on a properly prepared sub-grade/sub-base/base or existing pavement, as the case may be and finished in accordance with the requirements of these specifications and in close conformity with the lines, grades, cross sections and thickness as per approved plans or as directed by the Engineer.
- 2.3.1.2 It is, however, not desirable to lay water bound macadam on an existing thin black topped surface without providing adequate drainage facility for water that would get accumulated at the interface of existing bituminous surface and water bound macadam.
- 2.3.2. **Materials:**
- 2.3.2.1 **Coarse aggregates:**
- 2.3.2.1.1. **General requirements:**
Coarse aggregates shall be either crushed or broken stone, crushed slag, over burnt (jhama) brick aggregates or any other naturally occurring aggregates such as kankar, literates of suitable quality (which shall be used in sub-base course only). The aggregates shall conform to the physical requirements set forth in Table mentioned below. The type and size range of the aggregate shall be specified in the contract or shall be as specified by the Engineer

TABLE-5
PHYSICAL REQUIREMENTS OF COARSE AGGREGATES FOR
WATER BOUND MACADAM FOR SUB-BASE/BASE-COURSES

Test	Test Method	Requirements
Los Angles Abrasion value (*)	IS: 2386 (Part - IV)	50 percent (Max)
(or)		
Aggregate Impact value (*)	IS: 2386 (Part - IV) or IS:5640(**)	40 percent (Max)
Flakiness Index (***)	IS: 2386 (Part-I)	15 percent (Max)

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

** Aggregates like brick metal, kankar literate etc. which get softened in presence of water shall be tested for impact value under wet condition in accordance with IS:5640.

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

2.3.3. **Crushed or broken stone :**

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

2.3.4. **Crushed slag:**

Crushed slag shall be made from air cooled blast furnace slag. It shall be of angular shape, reasonably uniform in quality and density and generally free from thin, elongated and soft pieces, dirt or other deleterious materials. The weight of crushed slag shall not be less than 1120 Kg. Per Cu.M. and the percentage of glossy material shall not be more than 20. It should also comply with the following requirements:

i) Chemical stability : To comply with requirements of appendix of BS-1047.

ii) Sulfur content : Maximum 2 percent

iii) Water absorption : Maximum 10 percent.

2.3.5. **Over burnt (Jhama) brick aggregates:**

Jhama brick aggregates shall be made from over burnt bricks or brick bats and be free from dust and other objectionable and deleterious materials.

2.3.6 **Grading requirements of coarse aggregates:**

The coarse aggregate shall conform to one of the gradings given in below table or as specified, provided, however, the use of grading No.1 shall be restricted to sub-base course only

TABLE – 6

GRADING REQUIREMENTS OF COARSE AGGREGATES

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

Note: The compacted thickness for a layer with Grade 1 shall be 100 mm while for layer with other grades i.e. 2 & 3, it shall be 75 mm

2.3.7.

Screenings:

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

Screening shall conform to the gradings set forth in Table-7 mentioned below. The consolidated details of quantity of screenings required for various grades of stone aggregates are given in Table-8. Table-8 also gives the quantities of materials (loose) required for 10 SqM for subbase/base compacted thickness of 75/100 mm.

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

TABLE-7
GRADING FOR SCREENINGS

Grading Classification	Size of Screenings	Sieve Designation	Percent by Wt. passing the sieve
A	13.2mm	13.2 mm	100
		11.2 mm	95-100
		5.6 mm	15-35
		180 microns	0-10
B	11.2mm	11.2 mm	100
		5.6 mm	90 - 100
		180 microns	15 - 35

2.3.8

Binding material:

Binding material to be used for water bound macadam as a filler material meant for preventing ravelling shall comprise of a suitable material approved by the Engineer having a plasticity Index (PI) value of less than 6 as determined in accordance with IS:2720 (Part-V).

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

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

TABLE - 8
APPROXIMATE QUANTITIES OF COARSE AGGREGATES AND SCREENINGS
REQUIRED FOR 100/75 MM COMPACTED THICKNESS OF WATER BOUND
MACADAM (WBM) SUBBASE/BASE COURSE/FOR 10SqM

Coarse Aggregates				Screenings	
Classification	Size Range	Compacted thickness	Loose quantity	Stone screenings	Crushable Type such as Moorum or Gravel

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				Grading Classification and size	For WBM subbase /base course (Loose Quantity)	Grading/ classification Quantity & Size	Loose Quantity
Grading 1	90mm to 45mm	100mm	1.21 to 1.43CuM	Type-A 13.2mm	0.27 to 0.30CuM	Not Uniform	0.30 to 0.32CuM
Grading 2	63mm to 45mm	75mm	0.91 to 1.07CuM	Type-A 13.2mm	0.12 to 0.15 CuM	-do-	0.32 to 0.34CuM
Grading 2	-do-	-do-	-do-	Type-B 11.2mm	0.20 to 0.22 CuM	-do-	-do-
Grading 3	53mm to 32.4mm	75mm	-do-	-do-	0.16 to 0.21CuM	-do-	-do-

2.3.9

Construction Operations:

2.3.9.1.

Preparation of base:

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

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

2.3.9.2.

Inverted choke:

If water bound macadam is to be laid directly over the sub-grade without any other intervening pavement course, a 25 mm course or screenings (Grading B) or coarse sand shall be spread on the prepared subgrade before application of the coarse aggregates is taken up. In case of a fine sand or silty or clay subgrade, it is advisable to lay 100 mm insulating layer of screening or coarse sand on top of fine grained soil, the gradation of which will depend upon whether it is intended to act as a drainage layer as well. Alternatively appropriate geo-synthetics performing functions of separation and drainage may be used over the prepared sub-grade as directed by the Engineer.

2.3.9.3.

Spreading coarse aggregates:

The coarse aggregates shall be spread uniformly and evenly upon the prepared

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upgrade/sub-grade/base to proper profile by using templates placed across the road about 6 m apart, in such quantities that the thickness of each compacted layer is not more than 100 mm for grading 1 and 75 mm for grading 2 and 3, as specified in Clause 2.3.6. Wherever possible, approved mechanical devices shall be used to spread the aggregates uniformly so as to minimise the need for manual rectification afterwards. Aggregates placed at locations which are inaccessible to the spreading equipment, may be spread in one or more layers by any approved means so as to achieve the specified results.

The spreading shall be done from stockpiles along the side of the road way or directly from vehicles. In no case shall the aggregates be dumped in heaps directly on the surface prepared to receive the aggregates nor shall hauling over uncompacted or partially compacted base be permitted. No segregation of large or fine aggregates shall be allowed and the coarse aggregate as spread shall be of uniform gradation with no pockets of fine material.

The surface of the aggregates spread shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregates as may be required. The surface shall be checked frequently with a straight edge while spreading and rolling so as to ensure a finished surface as per approved plan.

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

2.3.9.4

Rolling:

Immediately following the spreading of the coarse aggregate, rolling shall be started with three wheeled power rollers of 8 to 10 tonne capacity or random or vibratory rollers of approved type. The type of roller to be used shall be approved by the Engineer base on trial run.

Except on super elevated portions where the rolling shall proceed from inner edge to the outer, rolling shall begin from the edges gradually progressing towards the center. First the edge/edges shall be compacted with roller running forward and backward. The roller shall then move inwards parallel to the center line of the road, in successive passes uniformly lapping preceding tracks by at least one half width.

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

The rolled surface shall be checked transversely and longitudinally with templates and any irregularities corrected by loosening the surface, adding or removing necessary amount of aggregates and re-rolling until the entire surface conforms to desired crossfall (camber) and grade. In no case shall the use of screenings be permitted to make up depressions.

Material which crushed excessively during compaction or becomes segregates shall be removed and replaced with suitable aggregates.

It shall be ensured that shoulders are built up simultaneously along with water bound

macadam courses.

2.3.9.5 **Application of screenings:**

After the coarse aggregate has been rolled to clause 2.3.9.4 screenings to completely fill the interstices shall be applied gradually over the surface. These shall not be damp or wet at the time of application. Dry rolling shall be done while the screenings are being spread so that vibrations of the roller cause them to settle into the voids of the coarse aggregate. The screenings shall not be dumped in piles but be spread uniformly in successive thin layers either by the spreading motions of hand shovels or by mechanical spreaders or directly from tipper with suitable grit spreading arrangement. Tipper operating for spreading the screenings shall be so driven as not to disturb the coarse aggregate.

The screenings shall be applied at a slow and uniform rate (in three or more applications) so as to ensure filling of all voids. This shall be accompanied by dry rolling and brooming with mechanical brooms, hand-brooms or both. In no case shall the screenings be applied so fast and thick as to form cakes or ridges on the surface in such a manner as would prevent filling of voids or prevent the direct bearing of the roller on the coarse aggregate. These operations shall continue until no more screenings can be forced into the voids of the coarse aggregate.

The spreading, rolling and brooming of screenings shall be carried out in only such lengths of the road which could be completed within one day's operation.

2.3.9.6. **Sprinkling of water and grouting:**

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

2.3.9.7. **Application of binding material:**

After the application of screenings in accordance with clause 2.3.9.5 and 2.3.9.6 the binding material where it is required to be used (clause 2.3.8) shall be applied successively in two or more thin layers at a slow and uniform rate. After each application, the surface shall be copiously sprinkled with water resulting slurry swept in with hand brooms, or mechanical brooms to fill the voids properly and rolled during which water, shall be applied to the wheels of the rollers if necessary to wash down the binding material sticking to them. These operations shall continue until the resulting slurry after filling of voids, forms a wave ahead of the wheels of the moving roller.

2.4 **BITUMINOUS COURSES:**

2.4.1. **Preparation of base for laying bituminous courses:**

2.4.1.1. **Description:**

This work shall consist of preparing base, on which bitumen courses are to be laid by repairing pot-holes and bring the surface to the specified lines, grade and cross sections, through a leveling course as and where necessary. The base to be prepared may be an existing water bound macadam course or black topped surface and the work shall be performed on such widths and lengths as may be directed by the Engineer-in-charge. This work also includes cutting and/or dressing of damaged surfaces of high areas etc.

2.4.2. **Materials:**

2.4.2.1 **For pot holes:**

For filling pot-holes, the materials used shall be coarse aggregate, screenings, stone chippings, straight run bitumen of a penetration grade 30/40 to 80/100 or a combination there of as specified conforming to the quality requirements of these materials in the specification for road and bridge works of Ministry of Surface Transport (road wing).

2.4.2.2. **For leveling course:**

The leveling course, as and where required, shall be the following types:

Type A: Premixed bituminous material corresponding to Clause 2.8 Open graded premix carpet, excepting the seal coat.

Type B: Premixed bituminous material conforming to Clause 2.7 with binder content of 3 percent by weight of total mix. The aggregate may conform to grading in Table 13 of clause 2.7.

2.4.3. **Construction Operations:**

2.4.3.1. **Patching of pot holes:**

Pot holes shall be drained of water and cut to regular shapes with vertical sides, all loose and disintegrated material shall be removed. The pot hole shall then be filled either with (i) coarse aggregate and screenings and compacted with heavy hand rammers or approved mechanical tampers, or with (ii) premixed chippings mixed after painting the sides and bottom of the holes with a thin application of bitumen or a combination of both, as directed by the Engineer-in-charge.

2.4.3.2. **Repairing cracked surface:**

Bituminous layer of cracked road surface shall be cut open and all disintegrated material shall be removed.

2.4.3.3. **Laying of leveling course:**

After filling the pot holes the base on which the leveling course is to be laid including the cracked surfaces which are cut open shall be thoroughly swept and scrapped clean of dust and any other extraneous material. The contractor shall assess the extent of undulations in the existing road and make up by laying a leveling course as and where necessary in order to provide a uniform smooth and leveling surface as per the tolerance limits prescribed in the specification.

2.5 **PRIMER COAT OVER GRANULAR BASE:**

2.5.1. **SCOPE:**

This work shall consist of application of single coat of low viscosity liquid bituminous material to an absorbent granular surface preparatory to any superimposed bituminous treatment or construction.

2.5.2. **Materials:**

The choice of bituminous primer shall depend upon the porosity characteristics of the surface to be primed as classified in IRC: 16-1965 Clauses 3.1 to 3.3.

These are:

- i) Surfaces of low porosity
- ii) Surfaces of medium porosity
- iii) Surfaces of high porosity.

2.5.2.1. The different ranges of viscosity requirements for the primers to be used for the different types of the surfaces to be primed, as given in Table-9.

TABLE-9
VISCOSITY REQUIREMENT OF PRIMERS

TYPE OF SURFACES	STANDARD TAR VISCOSITY OF PRIMER AT 60o C
Low porosity	0 – 5
Medium porosity	6 – 12
High porosity	16 - 32

2.5.2.2. The bituminous primer shall be Medium Curing (MC) or Slow Curing (SC) cut backs as per ISI:217/61. Apart from bitumen cut backs, emulsions, coal tar-pitch, creosote, etc. also can be used subject to the viscosity and surface requirements as in Table-9 being adhered to.

2.5.3. **Weather and Seasonal Limitations:**

The bituminous primer shall not be applied on a wet surface or during dust storm or when the weather is foggy or rainy. The prime coat for surface treatment should not be applied when the temperature in the shade is less than 10°C.

2.5.4 **Construction:**

2.5.4.1 **Equipment:**

The primer distributor shall be equipped for spraying the material uniformly at the specified rates and temperatures.

2.5.4.2 **Preparation of road surface:**

The surface to be primed shall be swept clean, free from dust and shall be dry. It shall be shaped to the specified grades and section. It shall also be free from cuts, any other irregularities and segregate materials. Minor depressions and pot holes may be ignored until the surface is primed, after which they shall be patched with a suitable premix material prior to the surface treatment.

2.5.4.3. **Application of bituminous primer:**

The bituminous primer shall be sprayed/distributed uniformly over the dry surface as per Clause 2.5.4.2 using either self propelled or towed pressure sprayer with self heating arrangement and spraying nozzle capable of spraying primer at a specified rates and temperature so as to provide a uniformly unbroken spread of primer. The primer shall be applied at the rate as specified in Table No.10.

TABLE 10
QUANTITY OF BITUMINOUS PRIMERS

GRADE OF PRIMER	QUANTITY PER 10 SQM IN KGs.
Primer for surfaces of low porosity	7.3 to 9.8
Primer for surfaces of medium porosity	9.8 to 12.2
Primer for surfaces of high porosity	12.2 to 14.6

Temperature of application of a primer need only be high enough to permit the primer to be effectively sprayed through the jets of the spray bar and to cover the granular base surface uniformly.

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The temperature of the bituminous cut back primer at the time of application may vary from 40oC to 80oC and that of bitumen emulsion between 10oC to 60oC. The quantity of primer as given in Table 10 can vary + 1.5 Kg. as directed by Engineer where specifically required.

Any pools of excess primer left on any part of the surface should be swept out over the adjacent surface and then a light spreading of sand or stone grit shall be applied.

The primer coat shall be applied only on the top most water bound macadam or any granular layer, over which the bituminous base course/wearing course is to be laid.

- 2.5.4.4. Curing of primer and opening to Traffic: It shall always be ensured that while opening to any kind traffic, the primed surface is fully cured and is not sticky to avoid being picked up by traffic. Normally, the primed surface shall be allowed to cure for not less than 24 hours and during this period no traffic of any kind shall be permitted.

2.5.4.5. **Laying of bituminous course over primed surface:**

Bituminous base course or wearing course shall be laid over the primed water bound macadam or any other granular base course, in the usual manner as per relevant specification for the same including the requirement of tack coat as per clause 2.6.

2.6. **TACK COAT:**

2.6.1. **Scope:**

This work shall consist of application of a single coat of low viscosity liquid bituminous material to an existing road surface preparatory to another bituminous construction over it.

2.6.2. **Materials:**

Binder: The binder used for tack coat shall be bitumen of a suitable grade appropriate to the region, traffic, rain fall and other environmental conditions as directed by the Engineer and conforming to IS:73, 217 or 454, as applicable, or any other approved cut back.

2.6.3. **Construction Operation:**

2.6.3.1. **Preparation of base:**

The surface on which the tack coat is to be applied shall be cleaned of dust and any extraneous material before the application of the binder, by using a mechanical broom or any other approved equipment/method as specified by the Engineer.

2.6.3.2. **Application of binder:**

Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer and sprayed on the base at the rate specified in Table 11. The rate of spread is in terms of straight run bitumen.

TABLE-11
RATE OF APPLICATION OF TACK COAT

TYPE OF SURFACE	BITUMEN QUANTITY IN KG.PER 10 SQ.MTRS. AREA
i) Norma bituminous surfaces	5 to 5.5.
ii) Dry and hungry bituminous surface	6.0 to 7.5
iii) Granular surfaces treated with primer	6.0 to 7.5
iv) Non bituminous surfaces	
a) Granular base (Not primed)	10.0
b) Cement concrete pavement	7.5

There is no need to apply a tack coat on a freshly laid bituminous course if the subsequent bituminous course is overlaid immediately without opening it to traffic

- 2.6.3.3. The binder shall be applied uniformly with the aid of either self propelled or towed bitumen pressure sprayer with self heating arrangement and spraying nozzles arrangement capable of spraying bitumen at specified rates and temperature so as to provide a uniformly unbroken

spread of bitumen.



The tack coat shall be applied just ahead of the on coming bituminous construction.

2.7 **BITUMINOUS MACADAM :**

2.7.1. **SCOPE:**

The work shall consist of construction, in a single course, of 50 mm/75 mm thickness of compacted crushed aggregates premixed with a bituminous binder to serve as base/binder course, laid immediately after mixing, on a base prepared previously in accordance with the requirement of these specifications and in conformity with the line, grades and cross sections shown on the drawing or as directed by the Engineer.

2.7.2. **Materials:**

2.7.2.1 **Bitumen:**

The bitumen shall be paving bitumen of suitable penetration grade within the range S-90 or A 35 to A 90 (30/40 to 80/100) as per Indian standard specifications for "Paving bitumen" IS:73:1961. The actual grade of bitumen to be used shall be decided by the Engineer appropriate to the region, traffic, rainfall and other environmental conditions.

2.7.2.2. **Aggregates:**

The aggregates shall consist of crushed stone, crushed gravel/single or other stones. They shall be clean, strong, durable of fairly cubical shape and free from disintegrated pieces organic or other deleterious matters and adherent coating. The aggregates shall preferably be hydrophobic and of low porosity. If hydrophilic aggregates are to be used the bitumen shall preferably be treated with anti stripping agents of approved quality in suitable doses. The aggregates shall satisfy the physical requirements set forth in Table - 12.

TABLE-12
PHYSICAL REQUIREMENTS OF AGGREGATES FOR BITUMINOUS
MACADAM

SNO	TEST	TEST METHOD	REQUIREMENT S
1	Los Angeles Abrasion Value(*)	IS:2386(Part-IV)	40% Maximum
2	Aggregate Impact Value(*)	-do-	30% Maximum
3	Flakiness index	IS:2386(Part-I)	35% Maximum
4	Stripping value	IS:6241	25% Maximum
5	Soundness:		
	i)Lose with sodium sulphate	5 cycles	12%
	ii)Loss with Magnesium Sulphate	5 Cycles	18%
6	Water absorption	IS:2386(Part-III)	62% Maximum

(*) Aggregates may satisfy requirements of either of the two tests.

Note: If crushed slag is used, Clause 2.3.4 shall apply. 2.7.2.3 The aggregate for bituminous macadam for different thickness shall conform to the grading given in Table 13.

TABLE-13
AGGREGATES FOR 50 MM COMPACTED THICKNESS OF BITUMINOUS
MACADAM

Sieve Designation (IS)	Percent by weight passing the sieve
26.5 mm	100
22.4 mm	75-100
11.2 mm	50-85
5.6 mm	20-40
2.8 mm	5-20
90 micron	0-5

2.7.2.4 Proportioning of materials:

The bitumen content for premixing shall be 4 percent by weight of the total mix except when otherwise directed by the Engineer.

The quantities of aggregates to be used shall be sufficient to yield the specified thickness after compaction.

2.7.2.5. Variation in proportioning of materials:

The contractor shall have the responsibility for ensuring proper proportioning of materials and producing a uniform mix. A variation in binder content ± 0.3 percent by weight of total mix shall, however, be permissible for individual specimens taken for quality control tests.

2.7.3. Construction Operation:

2.7.3.1 Weather and seasonal limitations:

The work of laying shall not be taken up during rainy or foggy weather or when the base course is damp or wet, or during dust storm or when the atmospheric temperature in shade 15oC or less.

2.7.3.2 Preparation of the base:

The base on which bituminous macadam is to be laid shall be prepared, shaped and conditioned to the specified lines, grades and cross sections in accordance with Clause 2.4 and a priming coat where needed shall be applied in accordance with Clause 2.5 as directed by the Engineer.

2.7.3.3 Tack coat:

A tack coat as per Clause 2.6 shall be applied over the base.

2.7.3.4 Preparation and transport of mix.

Bituminous macadam mix shall be prepared in a hot mix plant of adequate capacity and capable to yield a mix of proper and uniform quality with thoroughly coated aggregates. The plant may be either a weigh batch or volumetric proportioning continuous or drum mix type.

The temperature of binder at the time of mixing shall be in the range of 150°C to 165°C and that of the aggregate in the range of 125°C to 150°C provided that the difference in temperature between the binder and aggregate at no time exceeds 25oC.

Mixing shall be thorough to ensure that a homogeneous mixture is obtained in which all particles of the aggregates are coated uniformly, and the discharge temperature of mix shall be between 130°C to 160°C.

The mixture shall be transported from the mixing plant to the point of use in suitable tipper vehicles. The vehicles employed for transport shall be clean and be covered over in transit if so directed by the Engineer.

2.7.3.5 **Spreading:**

The mix transferred from the tipper at site to the paver shall be spread immediately by means of self propelled mechanical paver with suitable screeds capable of spreading, tamping, and finishing the mix true to the specified lines, grades and cross sections.

However, in restricted locations and in narrow widths where the available plant cannot be operated in the opinion of the Engineer, he may permit manual laying of the mix.

The temperature of the mix at the time of laying shall be in the range of 120°C to 135°C. In multi layer construction the longitudinal joint in one layer shall off set that in the layer below by about 150 mm. However, the joint in the top most layer shall be at the centre line of the pavement.

Longitudinal joint and edges shall be constructed true to the delineating line parallel to the central line of the road. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh material.

2.7.3.6 **Rolling:**

After the spreading of mix, rolling shall be done by 8 to 10 tonne power rollers or other approved equipment. Rolling should start as soon as possible after the material has been spread. Rolling shall be done with care to keep from unduly roughening the pavement surface.

Rolling of the longitudinal joints shall be done immediately behind the paying operation. After this, the rolling shall commence at the edges and progress towards the center longitudinally except that on super elevated portions it shall progress from the lower to upper edge parallel to the central line of the pavement.

The initial or break down rolling shall be done with 8 to 12 tonnes three wheel steel roller as soon as it is possible to roll the mix without cracking the surface or having the mix pick up on

the roller wheels. The second or intermediate rolling shall follow the break down rolling as closely as possible and be done while the paving mix is still at a temperature that will result

in maximum density. The final rolling shall be done while material is still workable enough for removal of roller marks with 8 to 10 tonne tandem roller. All the compaction operations i.e. breakdown rolling, intermediate rolling and final rolling can be accomplished by using a vibratory roller of 8 to 10 tonnes static weight. During the initial or break down rolling and final rolling, vibratory system shall be switched off. The joints and edges shall be rolled with a 8 to 10 tons stacking roller.

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

Rolling operational shall be completed in every respect before the temperature of the mix falls below 80°C.

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

2.8 **Open-grade premix carpet:**

2.8.1 **Using Bitumen:**

2.8.1.1. **Scope:**

This work shall consist of laying and compacting an open-graded carpet of 20 mm thickness in a single course composed of suitable small sized aggregates premixed with a Bituminous binder on a previously prepared base, in accordance with the requirements of these specifications, to serve as a wearing course.

2.8.2 **Materials:**

2.8.2.1 **Binder:**

The binder shall be bitumen of a suitable grade appropriate to the region, traffic, rainfall, and other environmental conditions, as directed by the Engineer and satisfying the requirements of IS:73, 217 & 454 or other approved cut back as applicable

2.8.2.2 **Aggregates:**

The coarse aggregate shall conform to clause 2.7.2.2

The aggregates shall satisfy the quality requirements set forth in Table 12 except that the Flakiness Index and Water absorption shall be limited to a maximum of 30 percent and 1 percent respectively.

2.8.2.3 **Proportioning of materials:**

The material shall be proportioned as per the quantities given in table 14.

TABLE 14

**QUANTITIES OF MATERIALS REQUIRED FOR 10 SQM OF ROAD SURFACE
FOR 20 MM THICK OPEN-GRADED PREMIX CARPET USING BITUMEN**

Aggregates for Carpet:

a) Stone chippings - 13.2 mm size passing 22.4 mm sieve and retained on 11.2 mm sieve	0.18 CuM
b) Stone chippings - 11.2 mm size, passing 13.2 mm sieve and retained on 5.6 mm sieve	0.09 CuM

Total :	0.27 CuM

Binder for premixing (quantities in terms of straight run bitumen)

a) For 0.18 CuM of 13.2 mm size stone chippings at 52 kg. per CuM	9.5 Kg.
b) For 0.09 CuM of 11.2 mm size stone chippings at 56 Kg. Per CuM	5.1 Kg.

Total :	14.6 Kg.

2.8.2.4 **Construction operation:**

2.8.2.4 **Weather and seasonal limitations:**

Clause No.2.7.3.1 shall apply.

2.8.2.5 **Preparation of base:**

The underlying base on which the bituminous carpet is to be laid shall be prepared, shaped and conditioned to the specified lines, grade and cross section in accordance with Clause 2.4 A primer coat where needed shall be applied in accordance with Clause 2.5 as

directed by the Engineer.

2.8.2.6

Tack coat:

A tack coat complying with Clause 2.6 shall be applied over the base preparatory to laying of the carpet.

2.6.2.7

Preparation of premix:

Mixers of approved type shall be employed for mixing the aggregates with the bituminous binder.

The binder shall be heated to the temperature appropriate to the grade of bitumen approved by the Engineer, in boilers of suitable design avoiding local overheating and ensuring a continuous supply.

The aggregates shall be dry and suitably heated to a temperature as directed by the Engineer before these are placed in the mixer. After about 15 seconds of dry mixing, the heated binder shall be distributed over the aggregates at the rate specified.

The mixing of binder with chippings shall be continued until the chippings are thoroughly coated with the binder. The mix shall be immediately transported from the mixer to the point of use in suitable vehicles or wheel barrows. The vehicles employed for transport shall be clean and the mix being transported covered in transit if so directed by the Engineer.

2.8.2.8

Spreading and rolling:

The premixed material shall be spread on the road surface with rakes to the required thickness and cross fall (camber) or distributed evenly with the help of a drag spreader without any undue loss of time. The cross-fall shall be checked by means of camber boards and inequalities evened out. On large scale works use of a mechanical paver finisher shall be preferable. As soon as sufficient length of bituminous material has been laid, rolling shall commence with 8 to 10 tonne power rollers, preferably of smooth wheel tandem type or other approved equipment. Rolling shall begin at the edges and progress towards the center longitudinally, except that on the super-elevated portions it shall progress from the lower upper edge parallel to the center line of the pavement.

When the roller has passed over the whole area once any high spots or depressions which become apparent shall be corrected by removing or adding premixed materials. Rolling shall then be continued until the entire surface has been rolled to compaction and all the roller marks eliminated. In each pass of the roller, preceding track shall be overlapped uniformly by at least 1/3 width. The roller wheels shall be kept damp to prevent the premix from adhering to the wheels and being picked up. In no case shall fuel/lubricating oil be used for this purpose. Excess use of water for this purpose shall also be avoided.

Rollers shall not stand on newly laid material while there is a risk that it will be deformed thereby.

The edges along and transverse of the carpet laid and compacted earlier shall be cut to their full depth so as to expose fresh surface which shall be painted with a thin surface coat of appropriate binder before the new mix is placed against it.

2.8.2.9

Seal coat:

A seal coat conforming to Clause 2.9 shall be applied to the surface immediately after laying the carpet.

2.8.3.

Opening to Traffic:

No traffic shall be allowed on the road till the seal coat has been laid. After the seal coat is laid, the road shall be opened to traffic according to Clause 2.9.4.

2.9

SEAL COAT:

2.9.1. **SCOPE:**
This work shall consist of application of a seal coat for sealing the voids in a bituminous surface laid to the specified levels, grade and cross fall (camber).

Premixed seal coat comprising of a thin application of fine aggregate premixed with bituminous binder.

2.9.2 **Materials:**

2.9.2.1 **Binder:** Clause 2.8.2.1 shall apply.

The quantity of binder to be utilised, in terms of straight run bitumen shall be 9.8 Kg. per 10 SqM area of Seal coat.

2.9.2.2 **Stone chippings for seal coat:**

The stone chippings shall consist of angular fragments of clean, hard, tough and durable rock of uniform quality throughout. They should be free of elongated or flaky pieces, soft or disintegrated stone, organic or other deleterious matter. Stone chipping shall be of 6.7 mm size defined as 100 percent passing through 11.2 mm sieve and retained on 2.36 mm sieve. The quantity used for spreading shall be 0.09 CuM. per 10 SqM area. The chippings shall satisfy the quality requirements spelt out in Table 12 except that the upper limits of Flakiness Index and water absorption values shall be 30 percent and 1 percent respectively.

2.9.3: **Construction operations:**

2.9.3.1 **Preparation of base:**

The seal coat shall be applied immediately after the laying of bituminous course which is re- quired to be sealed. Before application of seal coat materials, the surface shall be clean free of any dust or other extraneous matter.

TABLE-15

QUANTITIES OF MATERIAL REQUIRED FOR 10 SQM FOR SEAL COAT

SNO.	TYPE OF SEAL COAT	BINDER	STONE CHIPPINGS	SAND OR GRIT
01.	Seal coat	9.8 Kg.	0.09 CuM	-----

2.9.3.2 **Construction of seal coat:**

Mixers of approved type shall be employed for mixing the aggregates with the bituminous binder.

The binder shall be heated in boilers of suitable design, to the temperature appropriate to the grade of bitumen approved by the Engineer. Also the aggregates shall be dry and suitably heated to a temperature directed by the Engineer before the same are placed in the mixer. Mixing of binder with aggregate to the specified proportions shall be continued till the later are thoroughly coated with the former.

The mix shall be immediately transported from the mixing plant to the point of use and spread uniformly on the bituminous surface to be sealed.

As soon as sufficient length has been covered with the premixed material, the surface shall be rolled with 8-10 tonne smooth wheeled power roller. Rolling shall be continued till the premixed material completely seals the voids in the bituminous course and a smooth uniform surface is obtained.

2.9.4 **Opening to Traffic:**

In the case of Premixed seal coat, traffic may be allowed soon after final rolling when the premixed material has cooled down to the surrounding temperature.

2.10 **BITUMINOUS CONCRETE:**

- 2.10.1 **SCOPE:**
This work shall consist of constructing a single layer to 25 mm/40 mm thick bituminous concrete (asphaltic concrete) on a previously prepared bituminous base to the requirements to these specifications, to serve as a wearing course.
- 2.10.2 **Materials:**
- 2.10.2.1. **Bitumen:**
The bitumen shall be paving bitumen of suitable penetration grade within the range S35 to S90 or A35 to A90(30/40 to 80/100) as per Indian Standards Specifications for "Paving Bitumen" IS:73-1961. The actual grade of bitumen to be used shall be decided by the Engineer appropriate to the region, traffic, rainfall and other environmental conditions.
- 2.10.2.2 **Coarse aggregate:**
Clause 2.7.2.2 shall apply. The aggregates shall satisfy the physical requirements as given in table 12 except that the maximum values for the flakiness index and water absorption shall be 30 percent and 1 percent respectively. However, water absorption upto a maximum of 2 percent may be permitted in exceptional cases only.
- 2.10.2.3 **Fine aggregate:**
Fine aggregates shall be the fraction passing 2.8 mm sieve and retained on 90 microns sieve, consisting of crusher run screenings, natural sand or a mixture of both. These shall be clean, hard, durable, uncoated, dry and free from any injurious, soft or flaky pieces and organic or other deleterious substances.
- 2.10.2.4 **Filler:**
The filler shall be an inert material, the whole of which passes 710 micron sieve, at least 90 percent passing 180 micron sieve and not less than 70 percent, passing 90 micron sieve. The filler shall be stone dust, cement, hydrated lime, fly ash or any other non-plastic mineral matter approved by the Engineer
- 2.10.2.5 **Aggregate gradation:**
The mineral aggregates including mineral filler shall be so graded or combined as to conform to the gradings set forth in Table 16. For compacted layer thickness of 25 mm, grading 1 shall be used and for 40 mm grading 2 can also be used.

TABLE-16
AGGREGATE GRADATION FOR BITUMINOUS CONCRETE

Sieve designation	Percent by weight passing the sieve	
	Grading 1	Grading 2
22.4 mm	100
13.2 mm	100	90 – 100
11.2 mm	90-100	75 - 95
5.6 mm	60-80	55 - 75
2.8 mm	40-55	40 - 55
710 micron	20-30	20-30
300 micron	15 - 25	15-25
180 micron	10 - 20	10-20
90 micron	5-11	5 - 11

- 2.10.3 **Mix Design:**
- 2.10.3.1 **Requirement of mix:**
Apart from conformity with the grading and quality requirements of individual ingredients the Mix shall meet the requirements set forth in Table 17.
- 2.10.3.2 **Binder content:**
The binder content shall be so fixed as to achieve the requirements of the mix set forth in Table 17. Marshall method for arriving at the binder content shall be adopted.
- 2.10.3.3. **Job mix formula:**
The contractor shall intimate to the Engineer in writing, at least 20 days before the start of the work, the job mix formula proposed to be used by him for the work and shall give



the following details:

- i) Source and location of all materials
- ii) Proportions of all materials expressed as follows were each is applicable.

Binder	As percentage by weight of total mix.
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 results of test enumerated in Table 17 as obtained by the Contractor.

v) Test results physical characteristics of aggregates to be used.

While working out 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 satisfy the physical and strength requirements of these specifications.

Approval of the job mix formula shall be based on independent testing by the Engineer for which samples of all ingredients of the mix shall be furnished by the contractor as required by the former.

The approved job mix formula shall remain effective unless and until modified by the Engineer. Should a change in the source of materials be proposed, a new job mix formula shall be established and got approved from the Engineer before actually using the materials.

2.10.4 **Construction Operations:**
2.10.4.1 **Weather and seasonal limitations**

Clause 2.7.3.1. shall apply.

2.10.4.2 **Preparation of base:**

The base on which bituminous concrete is to be laid shall be prepared, shaped and conditioned to the specified levels, grade and cross fall (camber) in accordance with clause 2.4 or as directed by the Engineer. The surface shall be thoroughly swept and scraped clean and free of dust and other foreign matter.

2.10.4.3 **Tack coat:** A tack coat complying with clause 2.6 shall be applied over the base.

2.10.4.4 **Preparation of mix:**

Hot mix plant of adequate capacity and capable of producing a proper and uniform quality mix shall be used for preparing the mix. The plant may be either a weigh batch type of volumetric proportioning continuous or drum mix type.

The temperature of binder at the time of mixing shall be in the range of 150°C - 177°C and of aggregates in the range of 155°C - 163°C provided also that at no time shall the difference in temperature between the aggregates and binder exceed 14°C.

Mixing shall be thorough to ensure that homogeneous mixture is obtained in which all particles of the mineral aggregates the coated uniformly.

The mix shall be transported from the mixing plant to the point of use in suitable tipper vehicles. The vehicles employed for transport shall be clean and be covered in transit if

2.10.4.5 so directed by the Engineer.



Spreading:

The mix transported from the hot mix plant to the site shall be spread by means of a self-propelled mechanical paver with suitable screeds capable of spreading, tamping and finishing the mix to specified grade, lines and cross section.

However, in restricted locations and in narrow width where the available equipment cannot be operated in the opinion of the Engineer, he may permit manual laying of the mix.

TABLE – 17

REQUIREMENTS OF BITUMINOUS CONCRETE MIX

SNO.	DESCRIPTION	REQUIREMENT
01	Marshall stability (ASTM designation: D1559) determined on Marshall specimens compacted by 50 compaction blows on Each end.	340 Kg. (Minimum)
02	Marshall flow (mm)	
03	Percent voids in mix	2 - 4
04	Percent voids in mineral aggregate filled with bitumen	3 – 5
05	Binder content percent by weight of mix	75 - 85 5 - 7.5

2.10.4.6 **Permissible variations from the job mix formula:**

The contractor shall have the responsibility of ensuring proper proportioning of materials in accordance with the approved job mix formula and producing a uniform mix. The permissible variations of the individual percentages of the various ingredients in the actual mix from the job mix formula may be within the limits as specified in Table 18. These variations are intended to apply to individual specimens taken for quality control tests.

TABLE – 18

PERMISSIBLE VARIATIONS FROM THE JOB MIX FORMULA

SNO.	DESCRIPTION OF INGREDIENTS	PERMISSIBLE VARIATION BY WEIGHT OF TOTAL MIX IN PERCENTAGE	
01.	Aggregate passing sieve and Larger	5.6 mm	± 5.0
02.	Aggregate passing	2.8 micron sieve	± 4.0
03.	-do-	710 micron sieve	± 3.0
04	-do-	180micron sieve and 90micron sieve	± 1.0
05	-do-	Binder	± 0.3

The temperature of mix at the time of laying shall be in the range of 120°C – 160°C

Longitudinal joints and edges, shall be constructed true to the delineating lines parallel to the center line of the road. Longitudinal joints shall be offset by at least 150 mm from those in the lower course. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh material.

2.10.4.7 **Rolling:**

After the spreading of mix by paver, it shall be thoroughly compacted by rolling with a set of rollers moving at a speed not more than 5 km. per hour, immediately following close to the paver. The initial or breakdown rolling shall be with 8 to 12 tonne, three wheeled steel roller and the finished rolling with 8 to 10 tonnes tandem roller. Before finishing with the tandem roller, breakdown rolling shall be preferably followed by an intermediate rolling with a smooth wheel pneumatic roller of 15 to 30 tonne having a tyre pressure of 7 Kg./Cm².

All the compaction operations i.e. breakdown rolling intermediate rolling and finished rolling can be accomplished by using vibratory roller of 8 to 10 tonne static weight. During the initial or breakdown rolling and finished rolling, the vibratory system shall be switched off. The joints and edges shall be rolled with 8 to 10 tonne three wheeled static roller.

The wheels of roller shall be kept moist to prevent the mix from adhering to them. But in no case shall fuel/lubricating oil be used for this purpose nor excessive water poured on the wheels. Rolling shall commence longitudinally from edge and proceed towards the center, except that on super elevated portions, it shall progress from the lower to upper edge parallel to the center line of the pavement. The roller shall overlap on the fresh material with rear or fixed wheel leading so as to minimise the pushing of the mix and each pass of the roller shall overlap the preceding one by half the width of the rear wheel. Rolling shall be continued till the density achieved is at least 98 percent of that laboratory Marshall Specimen and all roller marks are eliminated. Rolling operations shall be completed in all respects before the temperature of the mix falls below 100°C.

2.10.5. **Opening to Traffic:**

Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

2.11. **MIX SEAL SURFACING:**

2.11.1 **Scope:**

2.11.1.1. This work shall consist of laying, and compacting mix seal surfacing in a single course composed of suitable aggregates premixed with a bituminous binder on a previously prepared base, in accordance with the requirements of these specifications to serve as a wearing course.

2.11.1.2 Mix seal surfacing shall be of Type A or Type B, as specified.

2.11.2. **Materials:**

2.11.2.1 **Binder:** Clause 2.8.2.1 shall apply.

2.11.2.2 **Coarse aggregates:**

Clause 2.8.2.2. shall apply the fine aggregates shall consist of crusher run screenings, natural sand or a mixture of both. These shall be clean, hard, durable, uncoated, dry and free from injurious soft or flaky pieces and organic or deleterious substances.

2.11.2.4 **Aggregate gradation:**

The coarse and fine aggregates shall be so graded or combined as to conform to the gradings set forth in Table 19.

TABLE 19
AGGREGATE GRADATION FOR MIX SEAL SURFACING

Sieve designation	Percent by weight passing the sieve	
	For Type A Mix Seal Surfacing	For Type B Mix Seal surfacing.
13.2 mm	100
11.2 mm	100	88 - 100
5.6 mm	52 – 88	31 - 52
2.8 mm	14 – 38	8 - 25
90 micron	0 – 5	0 - 5

2.11.2.5 **Proportioning of materials:**

The total quantity of aggregates used for Type A or B mix seal surfacing shall be 0.27 Cubic Metre per 10 SqM area. The quantity of binder used for premixing in terms of straight run bitumen shall be 22.0 Kg. And 19.0 Kg. per 10 Sq Mtr. area for Type A and Type B surfacing respectively.

2.11.3 **Construction Operations:**

Clauses 2.8.2.4 through 2.8.2.8 shall apply.

- 2.11.4. **Opening to Traffic:**
Traffic may be allowed after completion of the final rolling when the mix has cooled down to the surrounding temperature.
- 2.11.5. **Surface finish and quality control of work:**
The surface finish of construction shall conform to the requirements of the specification.
- 2.12. **QUALITY CONTROL:**
2.12.1 For quality control of road work section 900 of IRC specification shall be followed.
- 2.13. **ROAD MARKINGS:**
2.13.1 **General:**
The colour, width and layout of road markings all be in accordance with the Code of practice for board markings with paints, IRC: 35-1970.
- 2.13.2. **Materials:**
When ordinary paints are used for road marking, these shall conform to IS:164 - 1981.
- 2.13.3 **Ordinary road marking paints:**
These shall conform to either grade 1 or grade II (with minimum 4 hours wearing resistance) as per IS:164-1981.
- 2.13.4. **Application:**
Painting may be done by machine or by hand (preferably by machine). The contractor shall maintain traffic control while painting operations are in progress so as to cause minimum inconvenience to traffic compatible with protecting the workmen.
- 2.13.5 The pavement temperature shall be a minimum of 10°C during application. All surfaces to be marked shall be thoroughly cleaned of all dust, dirt, grease, oil and all other foreign matter before application of the paint.
- 2.13.6. The finished lines shall be free from ruggedness on sides and ends and be in true plane with the general alignment of the carriage way. The upper surface of the lines shall be level uniform and free from streaks.
- 2.14. **MEASUREMENT FOR LEVELING COURSE** (Bituminous macadam leveling coarse on old road):
Before commencement of laying leveling course, levels shall be taken jointly by the Engineer-in-charge or his authorised representative and the contractor at 5 M intervals at longitudinal direction and at 1.75 M interval at transverse direction or at an interval depending upon site conditions and as directed by the Engineer-in-charge. These levels shall be recorded in the level book and plotted on plan and the same shall be signed by the contractor. Proposed formation levels of the finished bitumen surface shall be marked at corresponding points, levels of the consolidated bitumen surface shall be taken at points at which levels are taken earlier and these shall be recorded in the level book and also plotted on plan. Level books as well as the plan shall be signed by the contractor as token of acceptance of levels. The volume of consolidated mix for the leveling course shall be calculated by taking average thickness laid. Quantity for payment shall be theoretical quantity on theoretical calculations or the actual quantity based on actual finished levels) whichever is less.
- 2.15 **BUILT UP SPRAY GROUT BASE COURSE:**
2.15.1. **Description:**
This work shall consist of a two layer composite construction of compacted crushed course aggregates with application of bituminous binder after each layer and key aggregates on the top of the second layer, accordance with requirements of these specifications and in conformity with the lines, grades, and cross-sections shown on the drawings or as directed by the Engineer-in-charge. Thickness of the coarse shall be 75 mm.
- 2.15.2 **Materials:**

2.15.2.1. **Binder:**

The binder shall be straight run bitumen of a suitable grade, as directed by the Engineer-in-charge, satisfying the requirements of IS:73, or an approved cut back.

2.15.2.2. **Aggregates:** The aggregates shall consist of crushed stone, crushed gravel (single) or other stones. They shall be clean, strong, durable of fairly cubical shape and free of disintegrated pieces, organic or other deleterious matter and adherent coatings. The aggregates shall preferably be hydrophobic and of low porosity.

The aggregates shall satisfy the physical requirements set forth in Table-21. The coarse and key aggregates for built-up spray grout shall conform to the gradings given in Table 22 & Table-6.

TABLE-21
PHYSICAL REQUIREMENTS OF AGGREGATES FOR BUILT-UP SPRAY GROUT

SNO	TEST	TEST METHOD	REQUIREMENTS
01	Los Angles Abrasion value(*)	IS: 2386 (Part-IV)	40% (Max)
02	Aggregate Impact Value (*)	-do-	30% (Max)
03	Flakiness Index	IS:2386 (Part-I)	35% (Max)
04	Stripping value	As per relevant standard	25% (Max)
05	Water Absorption	IS:2386 (Part-III)	2% (Max)

(*) Aggregates may satisfy requirements of either of the two tests.

Note: If crushed slag is used Clause 2.3.4. shall apply

TABLE - 22
GRADING REQUIREMENTS OF COARSE AND KEY AGGREGATE FOR BUILT UP SPRAY GROUT

Sieve designation	Percent by weight passing the sieve	
	Coarse Aggregate	Key Aggregate
53 mm	100	----
26.5 mm	40 - 75	----
22.4 mm	----	100
13.2 mm	0 - 20	40 - 75
5.6 mm	----	0 - 20
2.8	0 - 5	0 - 5

2.15.3. **Construction Operations:**

2.15.3.1. **Weather and seasonal limitations:**

Built-up spray grout shall not be constructed during rainy weather, when the base is damp or wet or when the atmospheric temperature in shade is 16° deg. C or below.

2.15.3.2. **Preparation of base:**

The base on which built up spray grout is to be constructed shall be prepared, shaped and conditioned to the specified lines, grades and as directed by the Engineer-in-charge. The surface shall be thoroughly swept and scraped clean of dust and other foreign matter. A primer coat where needed shall be applied in accordance with Clause 2.5.

2.15.3.3. **Tack Coat:**

The binder shall be heated to the temperature as recommended by the manufacturers and this apply uniformly to the base by means of a sprayer.

2.15.3.4 **Spreading and rolling coarse aggregates for the first layer:**

Immediately after the application of tack coat, the coarse aggregate in a dry and clean form shall be spread uniformly and evenly at the rate of 0.5 Cu.M per 10 SqM area. The surface of the layer shall be carefully checked with templates and all high and low spots remedied by removing or adding aggregate as may be required.

Immediately after spreading of the aggregates, the entire surface shall be rolled with a 8-10 tonne smooth wheeled roller. Rolling shall commence at the edges and progress towards the centre except in super elevated portions where it shall proceed from the inner edge to the outer. Each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass.

After initial rolling the surface shall be checked transversely and longitudinally with templates and any irregularities corrected by loosening the surface adding or removing necessary amounts of aggregate, followed by rolling.

Rolling shall be stopped before voids in the aggregate layer are closed to such an extent as to prevent free and uniform penetration of the binder.

2.15.3.5. Application of binder first spray:

The binder shall be heated to the temperature appropriate to grade of bitumen approved by the Engineer-in-charge and sprayed on aggregate layer at the rate of 15 Kg./10 SqM in a uniform manner with the help of manual (or) mechanical sprayers. Excessive deposits of binder caused by stopping or starting of the sprayers or through leakage of any other reason shall be corrected promptly.

2.15.3.6. Spreading and rolling of coarse aggregate for the second layer:

Immediately after the first application of binder, the second layer of coarse aggregates shall be spread and rolled to clause 2.15.3.4.

2.15.3.7. Applications of binder second spray:

The second aggregate layer shall then be given a binder spray at the rate of 15 Kg./10 SqM to clause 2.15.3.5.

2.15.3.8. Application of key aggregate:

Immediately after second application of the binder, key aggregates in the clean and dry state shall be spread uniformly at the rate of 0.13 CuM/10 SqM so as to cover the surface completely. If necessary, the surface shall be broomed to ensure uniform application of the key aggregates. The entire surface shall then be rolled with a 8-10 tonne, smooth wheeled roller to clause 2.15.3.4. While rolling is in progress, additional key aggregates, where required, shall be spread by hand, rolling shall continue until the entire coarse is thoroughly compacted and the key aggregates are firmly in position.

2.15.3.9. The built-up spray grout shall be provided with final surfacing without any delay. If there is to be any delay, the course shall be covered by a seal coat to the requirements of Clause 2.9 before allowing any traffic over it.

2.16 Repair to BT road in filling up the pot holes.

2.16.1. Preparation of base for repairing pot holes.

2.16.1.1 Description: As per specifications Clause No. 2.4.1.1.

2.16.2. Materials:

The materials used shall be coarse aggregate, screenings, stone chippings, straight run bitumen of a penetration grade 30/40 to 80/100 or a combination these of as specified, confirming to the quality requirements of the materials in the specification for roads. The 40 mm and down graded hard granite metal should confirm the sieve analysis as specified in the table No.23 and physical requirements of aggregates for semi-grout shall satisfy as per table No.21.

TABLE NO.23

Grading requirements of coarse aggregate for semi-grout

Sieve Designation	Percentage by weight passing the sieve
53 mm	100
26.5 mm	40 - 75
13. 2 mm	0 - 20
2.8 mm	0 - 5

- 2.16.3 **Construction Operations:**
Pot holes shall be drained of water and cut to regular shape with vertical sides. All loose and disintegrated material shall be removed. After initial rolling the pot hole shall be applied a tack coat of 7.5 Kgs. of bitumen per 10 SqM. Then the pot hole shall be filled with precoated metal by using 1.59 Kgs. of Bitumen per 0.028 CuM. of metal by mechanical mixture.
- 2.16.4 Rolling to be done as per clause No.2.7.3.6 of specification.
- 2.17 **TESTING OF PREMIX CARPETING SAMPLE DURING CONSTRUCTION OF THE ROAD (FOR TESTING OF BITUMEN CONTENT).**
- 2.17.1. For every 1000 SqM or part thereof area of premix carpeting work, one sample is to be taken for bitumen content and this is in addition to other material sampling.
- 2.17.2. A sample of 2 Kgs. of premix carpeting material is to be drawn directly from the mixture machine for testing of Bitumen content (Mixture of screenings and bitumen) before laying on the road and same is to be transported to VSP laboratory within 24 hours of drawing the sample.
- 2.17.3. As per the item description the Bitumen content shall be of 3.30% of total mix (Annexure - I)



BILL OF QUANTITIES

NAME OF THE WORK : *Repair to BT road from VSP township to Oddugudem at Madharam Dolomite Mines.*

Open Tender Notice No. : VSP/Mines-10/2016-17 Date: 17.09.2016

Sl. No.	Description	Unit	Quantity	Rate (in Rs.)	Amount (in Rs.)
01	Preparing the base , repairing the cracked surfaces, assessing the extent of undulation and laying the leveling course for forming the road to specified lines ,grade and cross section by bituminous macadam leveling course with aggregate(granite) conforming to grading as per Table 13 of the specification and 3% bitumen of 80/100 grade by weight of the total mix and compacting with road roller and vibratory roller to the finished thickness all as per specifications and drawings using hot mix plant and mechanical pavers as per specification and /as directed by the Engineer and providing a tack coat of 7.5 Kg/10 Sqm area as per specification, all materials, tools, equipments and labour complete and as directed by the Engineer.	Cum	55	5716.66	314416.30
				TOTAL	314416.30

(Rupees Three Lakhs Fourteen Thousands Four Hundred Sixteen and Paise Thirty only)



**RASHTRIYA ISPAT NIGAM LIMITED
VISAKHAPATNAM STEEL PLANT
MINES DEPARTMENT
BILL OF QUANTITIES (BOQ)**

Name of the Work: *REPAIR TO BT ROAD FROM VSP TOWNSHIP TO ODDUGUEDEM AT MADHARAM DOLOMITE MINES.*
Tender No.: **VSP/Mines-10/2016-17 Dt. 17.09.2016**

1. The quantities indicated in are approximate and may vary to a wide range. Payment shall be made as per the actual work carried out at corresponding accepted rate.
2. Where ever old items are replaced for fixing new items, all related connections are to be made good for proper functioning of new items. Dismantled / old items are to be handed over to the stores.

No.	Description	Unit	Qty.	Rate	Amount (Rs.)
	As per the detailed Bill of Quantities enclosed in 1(One) pages	Estimated Value : (Rupees Three Lakhs Fourteen Thousands Four Hundred Sixteen and Paise Thirty only)			3,14,416.30

TOTAL AMOUNT QUOTED IN FIGURES: (Rs.) _____

TOTAL AMOUNT QUOTED IN WORDS: (Rs.) _____

- Note: 1. Tenderer shall write their quoted offer both in WORDS and FIGURES. The quoted offer in WORDS shall be in CAPITAL / BLOCK letters.
2. If there is discrepancy between the amount mentioned in FIGURES and the amount mentioned in WORDS, the amount as mentioned in WORDS only shall be taken as the quotation of the tenderer.

THE ESTIMATE OF THIS TENDER IS BASED ON THE RINL / VSP APPROVED WAGE RATES, CONSEQUENT TO THE MINIMUM WAGE OF CONTRACT WORKER AS NOTIFIED BY THE REGIONAL LABOUR COMMISSIONER (CENTRAL), HYDERABAD, WHICH IS GIVEN BELOW. IN CASE REVISION IN THE MINIMUM WAGES OF CONTRACT TAKES PLACE, ESCALATION DUE TO THIS SHALL BE PAYABLE TO THE CONTRACT AS PER THE ESCALATION FORMULA INDICATED IN THE SPECIAL CONDITIONS OF CONTRACT:

	Unskilled Worker	Semi-skilled worker	Skilled worker
RINL / VSP APPROVED RATE (IN RUPEES)	485.75	546.05	634.15
MINIMUM WAGES AS NOTIFIED BY THE RLC (CENTRAL) HYDERABAD (IN RUPEES)	294.00	333.00	390.00

Signature of Tenderer