



**GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION  
(A Govt. of Gujarat Undertaking)**

Office of the Executive Engineer,  
1st Floor, Plot No.-622/A,  
Administrative Building, Near Notified Office,  
Valia Road, GIDC, Ankleshwar -393 002.  
Email: xen-ank@gidcgujarat.org

**E-TENDER NOTICE NO.03 OF 2026 - 27**  
**SR NO.04**

**For**

**Work of Construction of PQC approach road with SWD from NH-48  
at GIDC, Ankleshwar.(Re-Invited)**

**BIDDER'S SIGNATURE**

**Executive Engineer  
GIDC, Ankleshwar**

**Name of work:** Work of Construction of PQC approach road with  
SWD from NH-48 at GIDC, Ankleshwar.(Re-Invited)

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**BIDDER'S SIGNATURE**

**Executive Engineer  
GIDC, Ankleshwar**

ગુજરાત ઔદ્યોગિક વિકાસ નિગમ



(ગુજરાત સરકારનું સાહસ)

અધિક્ષક ઇજનેરશ્રી (મ.ગુ) ની કચેરી,

પાંચબત્તી, જી.આઇ.ડી.સી., ભરૂચ.

ફોન નંબર (૦૨૬૪૨)૨૪૨૪૪૨

જાહેર નિવિદા નં.૦૩/૨૦૨૬-૨૭

ગુજરાત ઔદ્યોગિક વિકાસ નિગમની વર્તુળ કચેરી અધિક્ષક ઇજનેરશ્રી(મ.ગુ), જી.આઇ.ડી.સી., ભરૂચનાં તાબા હેઠળ કાર્યરત વિભાગીય કચેરીઓ માટે અનુ.નં. ૦૧ ના કામો માટેનું ટેન્ડર આર.પદ્ધતી અને અનુ.પી.એફ.નં. ૦૨ થી ૧૭ ના કામો માટેના ટેન્ડરો ઓનલાઇન પદ્ધતી થી આમંત્રિત કરવામાં આવે છે. જેની અંદાજીત કિંમત પૈકી લઘુત્તમ અંદાજીત કિંમત રૂ. ૪૪,૫૮,૬૦૦.૦૦ અને મહત્તમ અંદાજીત કિંમત રૂ. ૩૦,૫૪,૮૪,૨૩૦.૪૧ ની વચ્ચે છે.

ઓનલાઇન ટેન્ડર વેબ સાઇટ <https://tender.nprocure.com> ઉપરથી ડાઉનલોડ-અપલોડ નિયત સમય-મર્યાદામાં કરી શકાશે. આ કામોની વિગતવાર જાહેર નિવિદા ઓફિસનાં નોટીસ બોર્ડ ઉપર અને જી.આઇ.ડી.સી.ની વેબસાઇટ [www.gidc.gujarat.gov.in](http://www.gidc.gujarat.gov.in) તેમજ માહિતી ખાતાની [www.statetenders.gujarat.gov.in](http://www.statetenders.gujarat.gov.in) માં જોઇ શકાશે. નિવિદામાં જણાવેલ તમામ ટેન્ડરો અથવા તે પૈકી કોઇ પણ એક, કારણ જણાવ્યા વગર સ્વીકારવા, ન સ્વીકારવા તેમજ રદ કરવા એ નિગમનો અબાધિત અધિકાર છે, જે તમામને બંધનકર્તા રહેશે. બાના મુક્તિ પ્રમાણપત્ર ગ્રાહ્ય/સ્વીકાર્ય નથી. વધુમાં, ટેન્ડરને લગતા તમામ સુધારા / વધારા <https://tender.nprocure.com> વેબ-સાઇટ પર ટેન્ડર ભરવાની છેલ્લી તારીખ સુધી જોવાની રહેશે.

સહી/-

અધિક્ષક ઇજનેર (મ.ગુ)

ગુ.ઔ.વિ.નિ., ભરૂચ.

**BIDDER'S SIGNATURE**

**Executive Engineer  
GIDC, Ankleshwar**

**GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION**

(A Govt of Gujarat Undertaking)  
Office of the Superintending Engineer (CG)  
2<sup>nd</sup> Floor, Narmada Commercial Complex,  
M.G.Road, PanchBatti, Bharuch-392001

Phone: (02642)242432/242442 FAX:(02642)241902

**E-TENDER NOTICE No. 03 of 2026-27**

The tender for the works vide Sr.no. 01for RFP and 02 to 17 having minimum cost Rs.44,58,600.00 to maximum cost Rs. 30,54,94,230.41are invited by office of the Superintending Engineer (CG), G.I.D.C., Bharuch under jurisdiction various offices through online.

The tenders for Online works can be uploading - download on website <https://tender.nprocure.com>. The detailed tender notice can be seen in GIDC office notice board / GIDC website [www.gidc.gujarat.gov.in](http://www.gidc.gujarat.gov.in) / information department website [www.statetenders.gujarat.gov.in](http://www.statetenders.gujarat.gov.in) . Right to reject any or all the tenders without assigning any reasons thereof are reserved by G.I.D.C., which will be binding to all bidders. Exemption certificate for Earnest Money Deposit should not be acceptable. Please stay touring web site - <https://tender.nprocure.com> for any corrigendum / addendum / modification till last date of receipt.

Sd/-  
Superintending Engineer (CG)  
G.I.D.C., Bharuch.

**BIDDER'S SIGNATURE**

**Executive Engineer  
GIDC, Ankleshwar**

**(NOT FOR PUBLICATION)**

**GUJARAT INDUSTRIAL DEVELOPMENT  
CORPORATION**



**(A Govt. of Gujarat Undertaking)**

Office of the Superintending Engineer (CG)  
2<sup>nd</sup> Floor, Narmada Commercial Complex,  
M.G. Road, PanchBatti, Bharuch-392001  
Phone: (02642)242432/24244 FAX:(02642)241902

**E-TENDER NOTICE NO. 03 OF 2026-27**

Online and Offline for the following works of GIDC are publically invited from the intending bidders registered in appropriate class with state Govt. of Gujarat R&B/ W.R.D / GIDC and other State Governments equivalent, by the **Superintending Engineer (CG), GIDC, "Bharuch", 2<sup>nd</sup> floor, Narmada Commercial Complex, Panchbatti, Bharuch 393001** under jurisdiction Executive Engineer (R&B), GIDC, Bharuch, Executive Engineer, GIDC, Ankleshwar, Executive Engineer (M&E), GIDC, Bharuch, Executive Engineer, GIDC, Vadodara and Executive Engineer (W/s & Drg.), GIDC, Bharuch on web site <https://tender.nprocure.com>, [www.statetenders.gujarat.gov.in](http://www.statetenders.gujarat.gov.in)

**DETAILS FOR ONLINE TENDERS :**

The tenders under Sr. No. 01 for RFP and 02 to 17 are invited percentage (%) above / below – B1 Agreement / Item rate – B2 Agreement and two bid System (Technical bid & Price bid). The bids will be opened on schedule date and thereafter on evaluation thereof, the price bid of the pre-qualified bidders, will only been opened.

**GENERAL DETAILS OF WORKS:**

Sr No	Name of work	(1) Estimated cost (2) Earnest Money Deposit (3) Non-refundable Tender Fee (Inclusive of 18% G.S.T)	Class of registration
	<b>Bharuch (R&amp;B) DIVISION</b>		
1	Project Management Consultancy Services for Construction & Development of CoE (Centre of Excellence) buildings as per requirement of Engineering, Textile and Chemical at GIDC Estates. (Re-invited)	(1) Rs. ----- (2) Rs. 1,00,000.00 (3) Rs. 2,832.00	As Per Tender Document
	<b>ANKLESHWAR DIVISION</b>		
2	Upgradation and Strengthening of remaining SWD of GIDC Jhagadia Estate by Notified	(1) Rs. 6,42,90,617.00 (2) Rs. 6,42,907.00	"A" Class and Above

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**Executive Engineer  
GIDC, Ankleshwar**

	Area, Jhagadia. (Re-invited)	(3) Rs. 14,160.00	
3	Construction of RCC SWD, Recharge well and Water Distribution Line & E.S.R. Tank at GIDC, Rajpipla-1 Industrial Estate. (Re-invited)	(1) Rs. 2,71,76,938.44 (2) Rs. 2,71,770.00 (3) Rs. 4,248.00	"B" Class and Above
4	Work of Construction of PQC approach road with SWD from NH-48 at GIDC, Ankleshwar. (Re-invited)	(1) Rs. 2,62,65,315.28 (2) Rs. 2,62,654.00 (3) Rs. 4,248.00	"B" Class and Above
5	Construction of RCC SWD and recharge well @ GIDC Rajpipla-2 Industrial Estate. (Re-invited)	(1) Rs. 2,45,35,140.00 (2) Rs. 2,45,352.00 (3) Rs. 4,248.00	"B" Class and Above
6	Repairing GIDC Staff Quarters 4 block of RCL-12-(17,18,19,20) at GIDC Ankleshwar.	(1) Rs. 99,88,359.48 (2) Rs. 99,884.00 (3) Rs. 2,832.00	"D" Class and Above
	<b>M&amp;E DIVISION, GIDC, Bharuch</b>		
7	Design, Engineering, Supply, Installation, Testing and commissioning of "Non Clog End Suction Type Horizontal Centrifugal Pump Set for effluent" with accessories and allied Electro-Mechanical and Instrumentation and SCADA work at Dahej PCPIR Pumping Station at Dahej - II. (Suva Village).	(1) Rs. 4,95,10,474.00 (2) Rs. 4,95,105.00 (3) Rs. 7,080.00	Bidder should be as per 2. Prequalification criteria for Work-(2.1) Eligibility and Having similar Experience
8	Annual Comprehensive Maintenance Contract (ACMC) for the work of Operation, Maintenance and Repairing of all and all risk comprehensive maintenance contract for all installed Air Quality Monitoring Station Covering all Manpower Support, Moving Crane, Transport, Sensor Replacement, Cloud Software and all Allied Accessories at Dahej PCPIR Industrial Estate.	(1) Rs. 3,37,28,000.00 (2) Rs. 3,37,280.00 (3) Rs. 7,080.00	Bidder should be as per 2. Prequalification criteria for Work-(2.1) Eligibility and Having similar Experience
9	Annual Comprehensive Maintenance Contract (ACMC) for the work of Operation,	(1) Rs. 3,28,81,000.00 (2) Rs. 3,28,810.00	Bidder should be as per 2.

**BIDDER'S SIGNATURE**

**Executive Engineer  
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	Maintenance and Repairing of all and all risk comprehensive maintenance contract for all Installed toxic gas removal system at all drainage pumping Station Covering all Manpower Support, Transport, Media Replacement and all allied accessories at Dahej GIDC Industrial Estate.	(3) Rs. 7,080.00	Prequalification criteria for Work- (2.1) Eligibility and Having similar Experience
10	Annual Comprehensive Maintenance Contract (ACMC) for the work of Operation, Maintenance and Repairing of all and all risk comprehensive maintenance contract for all Installed water quality monitoring buoy at all reservoir on Real Time Basis Covering all Manpower Support, Transport, Sensor Replacement, Cloud Software and all allied accessories at Dahej GIDC Industrial Estate.	(1) Rs. 2,03,38,000.00 (2) Rs. 2,03,380.00 (3) Rs. 4,248.00	Bidder should be as per 2. Prequalification criteria for Work- (2.1) Eligibility and Having similar Experience
11	Design, Engineering, Supply, Installation, Testing and commissioning of " Non Clog sewage Submersible type Pumps with accessories and allied Electro-Mechanical and Instrumentation and SCADA work accessories at Dahej PCPIR Pumping Station.	(1) Rs. 1,86,19,741.00 (2) Rs. 1,86,198.00 (3) Rs. 4,248.00	Bidder should be as per 2. Prequalification criteria for Work- (2.1) Eligibility and Having similar Experience
12	Design Supply Installation Testing & Commissioning of Solar Roof Top plant at GIDC Ankleshwar Office Building.	(1) Rs. 44,58,600.00 (2) Rs. 44,586.00 (3) Rs. 1,770.00	Bidder should be as per 2. Prequalification criteria for Work- (2.1) Eligibility and Having similar Experience
13	Annual Comprehensive Maintenance Contract (ACMC) for the work of Atmospheric Pollution Monitoring on Real	(1) Rs. 1,27,96,000.00 (2) Rs. 1,27,960.00 (3) Rs. 4,248.00	Bidder should be as per 2. Prequalification

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GIDC, Ankleshwar**

	Time Basis Covering all Manpower Support, Transport, Sensor Replacement, Cloud Software and all Allied Accessories Including Civil Foundation, GSM Connectivity, Transport, Maintenance Arrangement, Spares, Sensor replacement, Cloud Software, Manpower etc at Dahej GIDC Industrial Estate.		criteria for Work- (2.1) Eligibility and Having similar Experience
	<b>BARODA DIVISION</b>		
14	Construction of New Office Building at Vadodara.	(1) Rs. 9,99,93,434.00 (2) Rs. 9,99,935.00 (3) Rs. 14,160.00	"AA" Class and Sp. Category Building – I
15	Construction of basic Infrastructure facilities including Water supply Distribution Network, Toilet Block, Site grading and Pumping machinery at GIDC, Indranaj Estate.	(1) Rs. 4,29,54,610.42 (2) Rs. 4,29,547.00 (3) Rs. 7,080.00	"A" Class and Above
16	Construction of Flexible pavement road including street light at Sahera Industrial Estate. (Re-invited)	(1) Rs. 2,09,07,806.48 (2) Rs. 2,09,079.00 (3) Rs. 4,248.00	"B" Class and Above & Sp. Category Road - III
	<b>Bharuch (W/s &amp; Drg.) DIVISION</b>		
17	Work of water supply line infrastructure for M/s Petronet LNG Ltd for their Petrochemical complex at Dahej and ARHC complex at Eksal Village including Five years free maintenance guarantee period.	(1) Rs. 30,54,94,230.41 (2) Rs. 30,54,943.00 (3) Rs. 21,240.00	"AA" Class

#### (A) SCHEDULE OF E-TENDERING

(i)	Downloading of Tender Documents from Web site of <a href="http://www.nprocure.com">www.nprocure.com</a> (The tenderdocumentfor these work are available only in Electronic format which Bidder can download at free of cost)	<b>From 08<sup>th</sup> June 2026 to 20<sup>th</sup> June 2026 upto 17.00 hours</b>
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**BIDDER'S SIGNATURE**

**Executive Engineer  
GIDC, Ankleshwar**



(ii)	<b>SUBMISSION OF TENDER</b> <b>(A) Online submission</b> I) Online submission of bid documents. II) Scanned copies of DD fortender fee& EMD in electronic format only through online	<b>From 08<sup>th</sup> June 2026 to 20<sup>th</sup> June 2026 upto 17.00 hours</b>
	a) Other Documents required to be submitted by scanning in electronic format only through online <b>1) Required Class of registration</b> <b>2) Valid Bank Solvency and also as per para - C - Sub para 4</b>	<b>From 08<sup>th</sup> June 2026 to 20<sup>th</sup> June 2026 upto 17.00 hours</b>
	<b>(B) Submission in physical form</b> I) D.D. / FDR in original ( for Tender fee & EMD) Other documents mentioned in para C, Sr. No. 5 for the purpose of verification only (in physical form) by personally i.e by Speed Post / Currier / Hand delivery. ( Kindly refer C-1,2 &3)	<b>From 22<sup>nd</sup> June 2026 to 24<sup>th</sup> June 2026 upto 17.00 hours</b>
(iii)	<b>Opening of Technical Bid documents.</b>	<b>In the Office of Superintending Engineer (CG), GIDC, 2<sup>nd</sup> floor, Narmada Commercial Complex, PanchBatti, Bharuch as under:- Preferably On dtd. 25<sup>th</sup> June 2026 at 12.00 noon</b>

**(B) On line Submission of Tender**

- 1) Bidders can prepare & edit their offers number of times before tender submission date & time. After tender submission date & time, bidder cannot edit their offer submitted in any case. No written or online request in this regard shall be granted.
- 2) Bidder shall submit their offer i.e. Pre-qualification document with Technical Bid & Price Bid in Electronic format on above mentioned website & Date shown above after digitally signing the same.
- 3) **For the purpose of verification**, the original documents for Pre-qualification submitted in electronic format for Sr. No. 01 to 17 should be submitted in physical form as under:-
  - For Sr. No. 01 - O/o Executive Engineer, Construction Division, Dahej -II, GIDC, Bharuch, Narmada Commercial Complex, 1st floor, Panchbatti, Bharuch
  - For Sr. No. 02 to 06 - O/o Executive Engineer, GIDC Admin Building, Plot no. 624/B, Valia Road, GIDC, Ankleshwar-393002
  - For Sr. No. 07 to 13 - O/o Executive Engineer, (M&E) Dn. GIDC, 2<sup>nd</sup> floor, Narmada Commercial Complex, PanchBatti, Bharuch
  - For Sr. No. 14 & 16 - O/o Executive Engineer, GIDC, 5th floor, Unique Trade Centre, Sayajigunj, Vadodara
  - For Sr. No. 17 - O/o Executive Engineer, (W/s & Drg.) Dn., GIDC, Bharuch, Narmada Commercial Complex, 1st floor, Panchbatti, Bharuch

By personally i.e by hand delivery during office hours.
- 4) Offers submitted without digitally signed will not be accepted.
- 5) Offers i.e. Pre-qualification document with Technical Bid & Price Bid in physical form will not be accepted in any case.
- 6) It is Bidder's responsibility to verify Online Corrigendum / Amendments until last submission date and time as well as before Final Submission of Bid.

**BIDDER'S SIGNATURE**

**Executive Engineer  
GIDC, Ankleshwar**

- 7) Required documents for pre Pre-qualification document received later than the time specified will not be accepted in any case and the bid of that bidder shall be considered non-responsive.

**(C) Submission of Tender Fees, EMD**

- 1) Interested Bidders can view these tender documents online, but bidders who are interested in bidding these tenders can download tender documents from web site as mentioned above and bidder who wish to submit their offer shall pay non-refundable **tender fee in the form of AccountPayeeDemand Draft payable at Bharuch, Ankleshwar and Baroda respectively for the works as under drawn on any Nationalized Bank in favour of -**
  - **Executive Engineer, Construction Division, Dahej -II, GIDC, Bharuch for work at Sr. No. 01**
  - **Executive Engineer, GIDC, Ankleshwar for work at Sr. No. 02 to 06 & 12**
  - **Executive Engineer, GIDC, Bharuch for work at Sr. No. 07 to 11 & 13 & 17**
  - **Executive Engineer, GIDC, Baroda for work at Sr. No. 14 to 16**
- 2) EMD in the form of Account Payee Demand Draft / F.D.R. payable at Bharuch and Baroda drawn on any Scheduled / Nationalized Bank in favour of Executive Engineer (R&B), GIDC, Bharuch, Executive Engineer, GIDC, Ankleshwar, Executive Engineer, GIDC, Baroda and Executive Engineer (W/s & Drg.), GIDC, Bharuch respectively for the works pertaining to respective divisions as under. EMD in the form of Bank Guarantee of the Scheduled Bank or Nationalized Bank also acceptable as per the manner set out in the prevailing Form B1 & Form B2.
  - **Executive Engineer, Construction Division, Dahej -II, GIDC, Bharuch for work at Sr. No. 01**
  - **Executive Engineer, GIDC, Ankleshwar for work at Sr. No. 02 to 06 & 12**
  - **Executive Engineer, GIDC, Bharuch for work at Sr. No. 07 to 11 & 13 & 17**
  - **Executive Engineer, GIDC, Baroda for work at Sr. No. 14 to 16**
- 3) Demand Draft for E.M.D. & Tender Fee shall be submitted in Electronic Format only through Online (by scanning) while uploading the Bid. This submission shall mean that E.M.D. & Tender Fee are received. Accordingly, offer of those shall be opened whose E.M.D. & Tender Fee is received electronically as well as received in physical form. **For the purpose of realization of D.D. as stated above under para (C- 1 & C - 2). However, bidder shall send the D.D. in original along with other documents (as stated in para C- 5) by personally i.e. by Speed Post/ Courier /Hand delivery during office hours as per point No. B-3.**
- 4) **Required Documents mentioned as under (a), (b), (c) & (d) are mandatory for submitting scanned copies through ONLINE. Otherwise tender offer shall be treated as NON RESPONSIVE, without any further intimation.**
  - a) Scanned copy of tender fee and EMD
  - b) Required Class of registration, Latest Income Tax return filed, R.P.F.C registration certificate with latest challan, Pan Card & GST Registration certificate.
  - c) Fresh Valid Bank Solvency- (Calendar Year) - ( 20% value of the estimated cost put to tender)
  - d) Other documents if any mentioned in tender documents.

**BIDDER'S SIGNATURE**

**Executive Engineer  
GIDC, Ankleshwar**

- 5) **For the purpose of verification**, the original documents submitted in electronic format should be submitted in physical form **for the works in the manner set out below** hypersonally i.e. by hand delivery during office hours.

a) Original tender fee in form of DD and EMD in form of DD/ FDR.

- **Executive Engineer, Construction Division, Dahej -II, GIDC, Bharuch for work at Sr. No. 01**
- **Executive Engineer, GIDC, Ankleshwar for work at Sr. No. 02 to 06**
- **Executive Engineer (M&E), GIDC, Bharuch for work at Sr. No. 07 to 13**
- **Executive Engineer, GIDC, Baroda for work at Sr. No. 14 to 16**
- **Executive Engineer, GIDC, Bharuch for work at Sr. No. 17**

Tender fee, EMD in original and other required documents for verification received before or later than the time **From 22<sup>nd</sup> June 2026 to 24<sup>th</sup> June 2026 upto 17.00 hours** will not be accepted in any case and the bid of that bidder shall be considered non-responsive. GIDC will not be responsible for delay in receipt of such documents due to any reasons by the postal department or any other agencies.

**Any documents in supporting of tender bid shall be submitted in electronic format only through online (by Scanning etc.) and hard copy will not be accepted separately.**

**GENERAL :**

- (1) Intending bidders or their representative who wish to remain present at the time of tender opening can do so.
- (2) The tender fees for on line tender document will not be refunded under any circumstances.
- (3) EMD in the form specified in tender document only shall be accepted.
- (4) **Exemption certificate for Earnest Money Deposit should not be acceptable.**
- (5) Tenders without Registration Certificate, Special Category Certificate, Solvency Certificate, Tender fees, Earnest Money Deposit (EMD) and which do not fulfill all or any of the condition or submitted incomplete in any respect will be rejected.
- (6) This tender notice shall form a part of tender / contract document.
- (7) Conditional tender shall not be accepted.
- (8) Rules of GIDC are binding to the Tenderer.
- (9) GIDC reserves the rights to reject any or all tenders without assigning any reason thereof.
- (10) Please stay touring above web sites for any corrigendum / addendum/ modification till last date of receipt.

**NOTE :**

**If any clarification / query regarding these tenders are required, do not hesitate to contact our concerned Executive Engineers through mobile.**

**For Bharuch Division (R&B) - Shri A. R. Raval - I/c Executive Engineer - Mo. 9409046898**

**For Ankleshwar Division - Shri S. S. Das – Executive Engineer – Mo. 9726424264**

**For Bharuch Division (M&E)- Shri Kapil Oza - Executive Engineer - Mo. 9825608907**

**For Baroda Division – Shri D. K. Lad - Executive Engineer – Mo. 9879110077**

**For Bharuch Division (W/s & Drg.) - Shri A. R. Raval – I/c Executive Engineer – Mo. 9409046898**

**Sd/-**

**SE, GIDC, Bharuch**

**BIDDER'S SIGNATURE**

**Executive Engineer  
GIDC, Ankleshwar**

## MEMORANDUM OF WORK IN BRIEF

1)	Name of work	Work of Construction of PQC approach road with SWD from NH-48 at GIDC, Ankleshwar.(Re-Invited)
2)	Estimated cost	<b>Rs.2,62,65,315.28</b>
3)	Joint Venture (J.V)	Joint Venture (J.V.) is not allowed.
4)	Earnest Money Deposit (EMD) Total 1% of the estimated cost.	<p><b>Total amount Rs.2,62,654/-</b>  <b>Rs.2,62,654/-</b> in the form of D.D./F.D.R for the minimum period of 180 days in favor of "Executive Engineer, GIDC, Ankleshwar" from any Nationalized/Scheduled Bank or any approved bank by government's latest G.R.</p> <p><b>OR</b>  <b>Rs.50,000/-</b> in the form of D.D./F.D.R for the minimum period of 180 days in favor of "Executive Engineer, GIDC, Ankleshwar" from any Nationalized/Scheduled Bank or any approved bank by government's latest G.R.</p> <p><b>AND</b>  <b>Remaining amount of Rs.2,12,654.00/-</b> in the form of B.G./D.D./F.D.R for the minimum period of 180 days in favor of "Executive Engineer, GIDC, Ankleshwar" from any Nationalized / Scheduled Bank.</p> <p>(FDR or BG of schedule bank will be accepted as per the GR No. FD/MSM/e -file/4/2025/2712/D.M.O. Dated 01/04/2026 of Finance department of Government of Gujarat and as per the amendment issued by GoG from time to time)</p>
5)	Validity period of tender offer.	120 days from the date of opening of online bids.
6)	Security Deposit-10.00% of estimated cost put to tender+ GST @18% -	<b>Rs.31,00,000.00 (10.00%)</b>
(i)	Initial Security Deposit in the form of small saving or Narmada Bond or FDR - 2.5% of the estimated cost+ GST @18%. (Validity period of 15 months)	<b>Rs.7,75,000.00</b>
(ii)	To be deducted from R.A. Bill - 2.5% of the estimated cost+ GST @18%.	<b>Rs.7,75,000.00</b>

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(iii)	Performance Bond in form of BG / FDR of scheduled or Nationalize Bank or any approved bank by government's latest GR. - 5.00% of the estimated cost+ GST @18%. (Validity period of 15months )	<b>Rs. 15,50,000.00</b> (To be paid with initial security deposit) in the form of B.G./D.D./F.D.R for the minimum period of 180 days in favor of "Executive Engineer, GIDC, Ankleshwar" from any Nationalized / Scheduled Bank.  (FDR or BG of schedule bank will be accepted as per the GR No. FD/MSM/e -file/4/2025/2712/D.M.O. Dated 01/04/2026 of Finance department of Government of Gujarat and as per the amendment issued by GoG from time to time)
7)	Liquidated Damages	<b>As per clause No.2 of B-2</b> Form attached herewith.
8)	Defect liability period – <b>Refer modified clause-17A of form B-2</b> as per R&B Circular No.PRCH/102008 / (2076) / N dtd.31/01/2009.	The defect liability period shall be <b>three years</b> from the certified date of completion of work.
9)	Free Maintenance guarantee period under <b>clause no.17B of form B-2</b> –Free maintenance guarantee Bond in form of BG / FDR of scheduled or Nationalize Bank - 5% of the estimated cost+ GST @18%. (Validity period of 3 (Three) years from certified date of completion)	<b>Rs. 15,50,000.00</b> <b>3 (Three) Years--</b> Free Maintenance Guarantee with effect from the certified date of completion. (FDR or BG of schedule bank will be accepted as per the GR No. FD/MSM/e -file/4/2025/2712/D.M.O. Dated 01/04/2026 of Finance department of Government of Gujarat and as per the amendment issued by GoG from time to time)
10)	Workers Welfare Cess Under The Building & Other Construction Workers Cess Act 1996 ( <b>Labour Cess</b> )	<b>1%</b> of value of work done (i.e. Invoice Value including GST) shall be deducted from the all bills payable to the contractor.
11)	Testing Charges	<b>1%</b> Testing charges of the Estimated Cost + GST as applicable from time to time will be deducted from each Running Account Bill of agency.
12)	Time limit for completion of work from the date of written order to commence.	<b>09 (Nine) Months.</b>

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13)	GST & other taxes	<ol style="list-style-type: none"> <li>1. Estimated cost put to tender is excluding GST. GST will be paid additional as per applicable rate prevailing from time to time.</li> <li>2. All other statutory liabilities are part of estimated cost and will be bound by bidder.</li> <li>3. The Agency has to pay all Govt. Taxes (GST, etc.) whichever is applicable to this work as per the notification of government by time to time</li> </ol>
14)	Site Office accommodation for G.I.D.C. staff.	The agency has to arrange at his own cost a properly covered site office for GIDC Officials/staff having min. size of 6mt x 6mt with all required Furniture, Toilet facility, Latest updated version Computers, Laptop (I-7 or above) with Internet facilities, Laser Printers with required stationary, Cupboards, Mineral Waters etc. from the starting date of contract and to maintain till completion of the work satisfactorily.
15)	<b><u>Submission date &amp; time of tender documents</u></b>	
i)	a) Date on (or before) which the tender with DD / FDR for Tender fee & EMD (by scanning) including required documents must upload on the web site of <b><u>www.gidc.nprocure.com</u></b>	<b>From 08th June 2026 to 30th June 2026 upto 17.00 hours</b>
	<b>b) Date on (or before) which DD/FDR in original for Tender fee &amp; EMD must reach in the office of the Office of the Executive Engineer, 1st Floor, Plot No.-622/A, Administrative Building, Near Notified Office, Valia Road, GIDC, Ankleshwar -393 002. (By RPAD/Courier/Personally i.e. Hand Delivery)</b>	<b>From 1<sup>st</sup> July 2026 to 3<sup>rd</sup> July 2026 upto 17.00 hours</b> Physical submission of documents prior and after these dates will not be considered and bids of the agency will be considered as nonresponsive.
ii)	<b><u>Mode of sending the tender documents.</u></b>	

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	a) The tender with DD / FDR for Tender fee & EMD (by scanning) including required documents	By Online through E - Tendering process
	b) DD/FDR in original for Tender fee & EMD	By RPAD/Courier/Personally i.e. Hand Delivery to <b>Office of the Executive Engineer, 1st Floor, Plot No.-622/A, Administrative Building, Near Notified Office, Valia Road, GIDC, Ankleshwar -393 002.</b>
16)	<b>Opening of Technical bid</b>	<b>In the Office of Superintending Engineer (CG), GIDC, 2nd floor, Narmada Commercial Complex, Panchbatti, Bharuch as under:- Preferably On dtd. 04<sup>th</sup> July 2026 at 12.00 noon</b>
17)	Tender to be opened by	Superintending Engineer (CG), GIDC, 1 <sup>st</sup> floor, Narmada Commercial Complex, Panchbhatti, Bharuch.
18)	Description essential to be made on sealed cover for documents to be submitted by RPAD/Courier/Personally i.e. Hand Delivery	(1) <b><u>Name of Work</u></b> :Work of Construction of PQC approach road with SWD from NH-48 at GIDC, Ankleshwar.(Re-Invited)  (2) <b>Date of receiving the documents</b> <b>From 1<sup>st</sup> July 2026 to 3<sup>rd</sup> July 2026 upto 17.00 hours</b>

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19)	<b>Important Note :</b>	<ul style="list-style-type: none"> <li>❖ For any technical discrepancy, the latest version of MORT&amp;H / IRC shall be applicable.</li> <li>❖ Prospective bidders are requested to join the site visit.</li> <li>❖ GIDC reserves the right, without any obligation or liability, to accept or reject any or all the bid at any stage of the process, to cancel or modify the process or any part thereof or to vary any of the terms and conditions at any time, without assigning any reason whatsoever.</li> <li>❖ Registration required <b>"B" class &amp;Above</b></li> <li>❖ <b>GST registration certificate required mandatory</b></li> <li>❖ <b>Required Documents mentioned in as under (a), (b), (c)&amp; (d) are mandatory for submitting scanned copies through ONLINE. Otherwise tender offer shall be treated as NON RESPONSIVE, without any further intimation.</b> <ul style="list-style-type: none"> <li>a) Scanned copy of tender fee and EMD</li> <li>b) Required Class of registration, Latest Income Tax return filed, RPFC registration certificate with latest challan, GST Registration &amp; Pan Card.</li> <li>c) Fresh Valid Bank Solvency- ( 20% value of the estimated cost put to tender)</li> <li>d) GST registration certificate</li> </ul> </li> <li>❖ Submit the required documents online duly named and page numbered in proper manner for simplicity.</li> </ul>
20)	Site Visit	<p><b>Contact Person :</b></p> <p><b>1 Shri S.S.Dash</b> XEN, GIDC, Ankleshwar Mo. No. 9879645264</p> <p><b>1 2. Shri Chintankumar K Patel</b> DEE, GIDC, Ankleshwar. Mo. No. 9687481212</p>
21)	Box culvert Design	Agency will carry out the Structural Design and submit to GIDC for approval.

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22)	Traffic Signs	Agency will provide the Traffic Signs and divert the traffic through board and safety point items as directed by Engineer in Charge.
23)	Vehicle Accommodation	The agency has to arrange at his own cost to provide one (1) Nos., 4+1 four-wheeler, private or taxi passing A.C. vehicle for Engineer-in-charge / Supporting Staff at site for 24 hours with driver at free of cost for limited to 4500 Km per month.

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## GENERAL CONDITIONS

Tenderer shall very carefully read through and take note of following conditions :

1. The successful tenderer shall have to enter into an agreement in 'B-2' form. Tender can be inspected during office working hours and shall be part of agreement with successful tenderer.
2. The tenderer shall get himself well acquainted with the job requirement site conditions, route and alignment etc.
3. Contractor shall make his own arrangement for providing all necessary tools, plants, equipment's, manpower as required. No extra payment in any such respect would be made to the contractor.
4. In conformity with prevailing income tax Rules 2% and surcharges of bill value shall be deducted at source as per I.T. Rules for which necessary certificate shall be released by the Executive Engineer.
5. Security deposit of 5.00% of the estimated cost will have to pay 2.5% through each R.A. Bills and 2.50 % against the signing of agreement in the form of Narmada Bond / N.S.C. / FDR.
6. The EMD payable to GIDC by the tenderer by D.D. or F.D.R. of Nationalized bank/Scheduled bank or other banks as per Govt. latest GR for Rs. 50,000/- and remaining amount by B.G./DD/FDR of Nationalized bank / Scheduled bank or other banks as per Govt. latest GR shall be drawn in favor of Executive Engineer, GIDC, Ankleshwar. The tender fee payable to GIDC by DD only.
7. 1% amount of the work done will be deducted from each R.A. bill in respect of Gujarat Building & Other Construction work – Labour Welfare Cess
8. Contractor shall have to mention their Regional Provident Fund number.
9. The rate quoted by the agency should remain force throughout the contract period i.e. for the period .
10. Rates quoted by the contractor shall be excluding GST but inclusive of all other taxes and duties.
11. Staff of contractor should cover under suitable insurance scheme.
12. **The tenderer has to take site visit and understand the work before submitting the tender.**
13. **The tenderer has to give the consent that they have already taken the site visit and understand the nature of work. Go through item specifications.**
14. The contractor shall be responsible for theft of the materials etc.
15. The medical facilities, weekly off, safety equipment's, over time etc. as per Government Act, will be provided by the agency to the staff engaged for the job.
16. In case of accident during the work, all the responsibility of man, machinery & property will be rest with the agency.
17. The payment shall be made as per actual work done.
18. Machinery, materials, labours etc. are to be brought by agency at his own expenditure.
19. The contractor shall have to engage qualified plumber & Supervisor. The labours who shall be fit to work in mud in any weather shall be engaged.

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20. The order for materials shall be placed time to time and when required. Material shall have to be supplied on demand.
21. Material shall have to be supplied of standard quality as per related to IS specification. One stack of each type of material shall have to be stacked at site of work and have to be got tested for its requirement as per norms of quality control. If materials fails to required standards, than the same have to be removed from the site by the agency at his own cost.
22. If the tenderer are firm, company or limited concern, they should mentioned the names of all the partners or the Directors, as the case may be, in their forwarding letter and indicate the name of person who holds, the power of attorney, authorizing him to conduct all transactions on behalf of the firm, company or limited concern. A true copy of partnership deed or the articles of association and power of attorney shall be attached with the tender, in case; the tender is finalized in favor of successful tenderer. The contractor shall have to enter into the agreement as per the rules.
23. The successful bidder in whose favor the tender is finalize has to enter into agreement in B2form with GIDC. If agency desire to study the same, it is available in the office of Executive Engineer, GIDC, Ankleshwar in the office hours of any working days.
24. Testing charges of material shall be borne by agency as per tender clause. 1% of the estimated cost shall be deducted from the running account bills of the contractor for testing the quality of materials and workmanship. However, the agency has to establish at site of work the fully equipped laboratory for day to day testing like gradation, density, cube tests etc.
25. Agency shall have to provide the mobilization of staff for site visit daily till completion of work. ONE number AC Vehicle four wheelers to be provided with drivers& fuels in good condition. The vehicle should not be older than three years. This is mandatory to the bidder as a part of the tender but no separate claim shall be entertained. **If the above vehicle is not provided compensation shall be levied and deducted from the bill as decided by the engineer in charge.**
26. All the documents to be submitted online and originalDD and FDRfor tender fee and EMD will have to send physically.
27. Rates quoted by the contractor shall be exclusive of GST and GST will be paid extra.

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## **INFORMATION AND INSTRUCTION FOR BIDDERS**

### **INTRODUCTION:**

Bids i.e., Price Bid and Technical Bid for the Work of Construction of PQC approach road with SWD from NH-48 at GIDC, Ankleshwar is invited from Contractors on e-tendering process.

### **LOCATION OF WORK AND SITE INFORMATION:**

The work site is located near National Highway at Ankleshwar.

**SCOPE OF WORKS:** The works include site clearings and jungle cutting before starting the work & after completion of the works, making temporary approach to the site of work, Liaisoning and co-ordination with local people & local authorities for smooth working.

The contractor shall co-operate with local people & plot / shed's holders to maintain cordial working environment and shall take full care to minimize hassles to the local people & plot / shed's holders while working. The contractor shall, upon the completion of works, hand over the site of works in neat & clean manner. The proposed works are as under.

### **1. BIDDER'S RESPONSIBILITY**

The intending Bidders shall be deemed to have visited the site and familiarized themselves thoroughly with the site conditions and all other aspects affecting the work under this Contract before submitting the tender. No claim / extension of time whatsoever shall be entertained on account of prevailing site conditions.

Interested Bidders may obtain further information at the following address:

#### **1) Executive Engineer, GIDC, Ankleshwar.**

1st Floor, Plot No.-622/A,  
Administrative Building, Near Notified Office,  
Valia Road, GIDC, Ankleshwar -393 002.

### **2. EARNEST MONEY DEPOSIT (EMD)**

EMD is payable in the manner set out in the Form B-2.

Demand Draft for E.M.D. shall be submitted in electronic format only through online (by scanning) while uploading the bid. The submission shall mean that E.M.D. is received for purpose of opening the bid. Accordingly offer of those shall be opened whose E.M.D. is received electronically. However bidder shall submit the DD in original to **1) Executive Engineer, GIDC, Ankleshwar** payable at Ankleshwar. As per the schedule specified in tender notice for submission of document in physical form i.e. **From 1<sup>st</sup> July 2026 to 3<sup>rd</sup> July 2026 upto 17.00 hours** submission of document before 22/06/2026 and after 24/06/2026 will not be considered and offer treated as non-responsive. Exemption certificate shall not be acceptable.

Earnest money in specified form @ 1.00 % of the estimated cost must be sent as mentioned above preceding electronically Tenderer may pay earnest money up to Rs. 50,000 in cash or in the form of Crossed Demand Draft or fixed deposit or fixed deposit at-call receipts with a validity period of not less than 180 days of Nationalized or Scheduled bank or any approved bank by government's latest GR or Narmada/Shrinidhi F.D.Rs. drawn in favor of

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Executive Engineer/Divisional Officer concerned. Earnest money by cheque & Bank Guarantee shall not be accepted. (vide R & BD G. R. No. TNC/ 1090/(100) (4)-C, dated 4-11 - 2000). However in respect of the works estimated to cost above Rs. 50 lacs, the amount of earnest money in excess of Rs. 50,000 can be offered by the contractor, at his choice, in the form of Bank Guarantee of the Scheduled or nationalized Bank or any approved bank by government's latest GR only. The Bank Guarantee in such cases will be furnished in the following form. In such cases also, the amount of earnest money first Rs. 50,000 will be paid only in the form of crossed demand drafts or fixed deposit receipts or deposit at call receipts worth the validity period of not less 180 days of the nationalized or Scheduled or Narmada/ Shrinidhi F.D.

If the contractor does not turn up to pay the Security Deposit and execute contract agreement within specified (or extended) time after intimation to him about acceptance of his offer, the earnest money paid for this work will be forfeited according to Clause-1 of this tender form tenderer's tender shall be rejected and then according to aforesaid provision of tender, action to blacklist the Contractor will be initiated without Delay. (Vide R & B D G.R. No. Misc.- 1097 -90-1091/97 -Z/C dated 04-10-97 & Parach-102008-5-C-Partfile dated 27-11-08).

***Bank Guarantee is permissible only when the estimated cost of work is more than Rs. 50 lacs.***

**BANK GUARANTEE**

Whereas M/s \_\_\_\_\_ (hereinafter called the Tenderer) is desirous and preferred to tender for works in accordance with the terms and conditions of tender for the work of \_\_\_\_\_ and where as We, Bank, agree to give the tenderer a guarantee for the Earnest Money.

Therefore, we hereby affirm that we are guarantors on behalf of the Tenderer upto total rupees \_\_\_\_\_ in words) Rs. \_\_\_\_\_ ( in figures) and we undertake to pay to Executive Engineer \_\_\_\_\_ Division \_\_\_\_\_ Department of Government of Gujarat \_\_\_\_\_ upto his first written demand, without demur, without delay and without the necessity of a previous notice of judicial or administrative procedures and without the necessity to prove to the Bank the defects or shortcomings or debits of the contractor any sum within the limit of Rs. \_\_\_\_\_.

We further agree that the Guarantee herein contained, shall remain in full force and effect during the period that would be taken for the acceptance of tender.

However, unless a demand of claim under this guarantee is made on us in writing on or before the \_\_\_\_\_ (Date to be specified - will not be less than 180 days from the stipulated date of receiving the tender) we shall be discharged from all liabilities under this guarantee thereafter.

We undertake not to revoke the guarantee during its currency except with the previous consent of the Executive Engineer \_\_\_\_\_ Division \_\_\_\_\_ in writing. We lastly undertake not to revoke the guarantee for any charge in constitution of the Tenderer or of the Bank.

**Date Signature & Seal of Guarantor** \_\_\_\_\_

**Bank Address** \_\_\_\_\_

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GIDC, Ankleshwar**

The Earnest Money submitted in the form of Deposit-At-call receipt shall need minimum validity of six months from the last date of online submission of tender. Tender not supported with tender fee, Earnest Money & documents and not submitted in electronic format (by scanning) while uploading the bid shall be rejected as NON Responsive. If the tenderer modifies or withdraws his tender, the Earnest Money (in case of EMD exemption certificate, proportionate amount equivalent to EMD of a particular tender) shall be forfeited and the tenderer may be disqualified from tendering for future works under the Government.

The Earnest Money will be returned to the unsuccessful tenderer. The Earnest Money will be returned to the successful tenderer after he furnishes security deposit and duly enters into the contract.

Within Ten days or within such time as may be decided by the Tender Inviting Authority from date of receipt of the Letter accepting his tender, the successful tenderer shall furnish the required security deposit and attend the office of the Tender Inviting Authority for execution of the contract documents. If he fails to furnish the security deposit or execute the contract document, his Earnest Money (in case of EMD exemption certificate equivalent amount there from) shall be forfeited and action to blacklist the contractor bill be initiated without delay (Vide R & B.D. G. R. No. Misc. 1097-90-1091-97 -Z/C dated 4-10-97).

### 3. **SECURITY DEPOSIT (SD) – 5.00%of Estimated Cost put to tender.**

SD is payable in the manner set out in the Technical Bid with Prequalification Application by the successful tenderer / Bidder.

Initial Security Deposit in the form of small saving or Narmada Bond or FDR – 2.50% of the estimated cost + 18% GST. (Validity period of 15 months)	<b>Rs.7,75,000.00</b>
To be deducted from R.A. Bill - 2.50% of the estimated cost + 18% GST.	<b>Rs. 7,75,000.00</b>

### 4. **PERFORMANCE BOND – 5.00% OF THE ESTIMATED COST PUT TO TENDER**

Performance Bond in the form of Bank guarantee of Nationalized Bank / scheduled bank is payable in the manner set out in the Form B-2 from section-2 clause-1 along with initial security deposited by the successful bidder

Performance Bond of scheduled or Nationalize Bank / scheduled bank - 5.00% of the estimated cost + 18% GST. (Validity period of 15 months)	<b>Rs.15,50,000.00</b> (To be paid with initial security deposit)
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### 5. **PROGRAMME OF WORK :**

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**Executive Engineer  
GIDC, Ankleshwar**

The program of work for this contract is as under.

<b>Online Submission of Bid Document</b>	<b>Period for Validity of offer</b>	<b>Period of completion</b>
<b>From 08th June 2026 to 30th June 2026 upto 17.00 hours</b>	<b>120 days from the date of opening of online bids.</b>	<b>09 Months from the date of work order</b>

The time is essence of the contract. The contractor shall have to ensure progress of the work proportionately as per Schedule-C of B-2 agreement.

#### **6. SUPERVISION OF WORK:**

G.I.D.C reserves the right to appoint Third Party Inspectors (TPI) for quality assurance and quality control in addition to the Engineer-in-charge of the work & Quality Control branch of G.I.D.C. Head Office.

#### **7. FREE MAINTENANCE GUARANTEE PERIOD: Clause No.17 B of B-2 Form**

The scope of works also includes **three years free maintenance guarantee period from the certified date of completion of the works as per clause No.7.**

During this period, the contractor shall be responsible to make good, working condition and remedy at his own expenses, any defects, which may develop or may be notice for the work carried out by him or due to reasons attributed to him.

The Engineer-in-charge shall give the contractor a notice in writing about the defects with remedial measures and the contractor shall make good the same within period specified in the notice. In case of failure, on the part of the contractor to carry out / comply the instructions of Engineer-in-charge, the Engineer-in-charge may rectify or remove and re-execute the work at the risk and cost of the contractor.

The Engineer-in-charge shall be entitled to appropriate the whole or any part of the amount of (i) security deposit (ii) Performance Guarantee Bond in the form of B.G. or N.S.C. / F.D / S.S.N.N.L., and (iii) Free maintenance guarantee bond in the form of B.G. or N.S.C. / F.D / S.S.N.N.L towards the expenses, if any incurred by him / Engineer-in-charge for rectification / removal, and re-execution the work.

The contractor shall immediately recoup the amount so spent such that at any given time the security deposit, Performance Guarantee Bond or N.S.C. / F.D / S.S.N.N.L. and free maintenance guarantee bond for maintenance guarantee period shall be maintained as laid down in the Special condition of the contract.

If contractor fails to recoup the amount of Security deposit, Performance Guarantee Bond or N.S.C. / F.D / S.S.N.N.L. and free maintenance guarantee bond for maintenance guarantee period, Engineer-in-charge shall be entitled to recover the amount spent over the above from the amount of security deposit, Performance Guarantee Bond or N.S.C. / F.D / S.S.N.N.L. and free maintenance guarantee bond for maintenance guarantee period.

The Corporation reserves the rights to en-cash the Performance Guarantee Bond & Bank Guarantee or N.S.C. / F.D / S.S.N.N.L., if required.

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## 8. DEFECT LIABILITY PERIOD :

The defect liability period shall be **Three years** from the certified date of completion of work or three monsoons whichever is later.

## 9. PRICE VARIATION CLAUSE & STAR RATE FOR CEMENT, STEEL AND BULK BITUMEN :

Please read the clause No. **Clause No. 59A of B-2 form** (Contract agreement to be executed) attached herewith for price variation for cement, steel & Bulk Bitumen. Star rate for cement, steel & bulk bitumen (Bulk Bitumen Emulsion & paving bitumen) is given in the **Clause No. 59A of B-2 form**(Contract agreement to be executed) attached herewith.

Sr.No.	Quantity	Star Rates (Excl. GST)	Month in which DTP is approved
1	Cement	Rs.385.00/50KG	April - 2026
2	Steel(FE-415 Grade)	Rs.73.00/KG	April - 2026

## 10. PRICE ESCALATION : Not applicable

The Price escalation shall not be payable as per GIDC circular.

## 11. MOBILIZATION ADVANCE: - Not applicable

Mobilization advance shall not be payable as per GIDC circular.

## 12. PURCHASE OF BITUMEN BY THE AGENCY:

The contractor shall have to purchase the bitumen in Bulk only from only Govt. recognized refinery & shall have to produce the original purchase bills along with the original gate passes etc. The bitumen to be brought on site includes all transportation charges, taxes etc. with all lead and lift.

## 13. POWER SUPPLY / WATER SUPPLY / OTHER UTILITIES:

The Contractor will make his own arrangement at his cost for power supply / water supply and other utilities required for the execution of work and arrangements for temporary distribution. All the works will be done as per IEA regulations. The Contractor shall ensure at his cost that all electrical lines, water supply lines and equipment & all installations are approved by the state electricity inspector before power can be supplied by State Electricity Board & GIDC for water

## 14. CONDITIONS OF CONTRACT:

Successful bidder shall have to enter in to prevailing agreement B-2 with GIDC, all the tender documents including pre-bid meeting minutes, negotiation letter and acceptance letter will form-A integral part of the contract. All works will confirm to the Indian Standards, specifications for road & Bridge works of Ministry of Road Transport and Highway or other equivalent standard mentioned in the contract document as approved by the Engineer-in-charge.

OTHER:

- ❖ In the all items of Schedule "B", the thickness mentioned is compacted thickness to be considered for the purpose of measurements and payments.

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- ❖ The contractor document shall include the original tender papers of GIDC, submission of contractor negotiation letter, letter of acceptance, agreement in B-2 form and the work order.
- ❖ In conformity with prevailing GST, Income Tax and surcharge of bill value or applicable at time to time shall be deducted at source for which necessary certificate shall be released by the Executive Engineer.
- ❖ In conformity with prevailing sales tax, rules vide No. ANVE: WORKS: TAX: 97-98: 2162, dtd. 24/11/1997, published by Additional Sales Tax Commissioner, Govt. of Gujarat, Sales tax and surcharge applicable of bill value shall be deducted at source or applicable at time to time shall be deducted for which necessary certificate shall be released by Executive Engineer.
- ❖ The contractor shall exhibit a board as per requirement of GIDC with detailed specification and details of work and amount at site at his own cost as directed by the Engineer-in - charge.

**BIDDER'S SIGNATURE**

**Executive Engineer  
GIDC, Ankleshwar**

## **SPECIAL CONDITIONS**

### **1) SCOPE OF WORK:**

- A. Testing Charges: All testing of material /output of processed material shall have to be got tested in a GERI (min.10%), GIDC approved laboratory (min. 10%) and remaining in field/site laboratory of agency, as defined in B-2 agreement. The testing charges of an amount of **1% of estimated cost put to tender** shall be deducted from the bills.
- B. There are chances to occur some excess / extra items in the tender qty. based on actual work as finalized by GIDC department. But, the bidder shall not claim anything beyond tender terms and conditions.
- C. If the quantity of any item may exceed from tendered quantity then the same shall have to be got approved from GIDC before execution by the bidder. For excess quantity as per clause **No. 14.2 of B-2** agreement, the clause shall be read as per the circular No./GIDC/ENG/CE/103 Dated: 18/07/2017 attached in this tender document which will be applicable for excess quantity.
- D. There are also chances that some items may not be required to execute/to execute in very less qty. than tendered quantity, as per finally approved decisions from GIDC. In this situation, the bidder shall not have any right to claim anything extra for such items.
- E. Joint Venture (J.V.) is not allowed.

### **2) MAINTENANCE GUARANTEE PERIOD:**

The contractor shall also undertake **Three years** comprehensive maintenance contract starting from the date of completion of the work.

- 1.1.)** The contractor shall have to give **Three years** maintenance guarantee period from the certified date of completion of work as per clause **No. 17B of B-2** agreement attached herewith. During this period contractor shall have to maintain & repair the damaged portion of road or the any portion of road and B.T. surface of road including pot holes, depressions, cut or worn out portion at his risk and cost as per direction of the Engineer-in-charge or GIDC. The requirement and nature of maintenance & repair work will be decided by Engineer-in-charge or GIDC and will be binding to contractor.

The contractor's scope of work does not include the damages caused by the following and contractor will not be liable for the same.

- Damages caused by overvoltage/under voltage from the Electricity service Company.
- Damages caused by External fire, mishandling or physical breakage due to mishandling or damages to the building due to any other reasons.
- Damages caused by natural disaster which includes Flooding, heavy rains, Earthquake, volcano, cyclone, lighting strike
- Damages caused by rioting, arsoning

### **1.2.) Maintenance works for all works done under this contract**

Special repairs shall be carried out for keeping the road works surface in perfect working conditions as may be required, from time to time. Action shall be taken for repairing of the damaged portion of road so that other components of the works

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does not get damaged due to any reasons whatsoever.

- 1.3.)** GIDC reserve the right to withdraw the maintenance work at any stage. The decision of GIDC will be final and binding to the contractor.

**1.4.) FREE MAINTENANCE GUARANTEE PERIOD: Clause No.17B of B-2 Form**

The contractor shall undertake three years comprehensive free maintenance contract with effect from the certified date of completion of the work, as per **Clause No.07 of B-2 Form**.

The contractor shall have to give three years free maintenance guarantee period from the certified date of completion of work as per clause No. 17B of B-2 agreement attached herewith. The requirement and nature of repair work will be decided by Engineer-in-charge and will be binding to contractor.

During the free maintenance guarantee period as described under Para above, Contractor shall be responsible for maintaining the CC & BT Roads including its components, Paved CC & BT portion including its components, & other works done under this contract including its components in best of condition by carrying out the routine maintenance works as decided by the Engineer-in-charge. The routine maintenance work shall be carried out as per direction of Engineer-in-charge.

Special repairs shall be carried out for keeping the CC & BT road surface in perfect riding condition with required camber and gradient as may be required, from time to time. Action shall be taken for repairing of all the pot holes, depressions, cuts in riding surface, as well as in the CC & BT paved portion & other works so that the crust as well as other components of the work does not get damaged due to any reasons whatsoever.

During the free maintenance guarantee period, contractor shall have to repair the damage portion of CC & B.T. surface of road at his risk and cost as per direction of the Engineer-in-charge or GIDC. Where ever, roughness value of B.T. surface during the maintenance period of 5 years is above 3500 MM/KM, the contractor will have to provide renewal coating overlay as per requirement of that portion in full width of B.T. surface for relevant length as directed by the Engineer-in-charge or GIDC. The roughness value of B.T. surface shall be measured by rough meter or suitable means as approved by the Engineer-in-charge or GIDC and said test shall be carried only through GERI or any other contractor as approved by the GIDC. The entire cost of testing shall be borne by the contractor. Contractor will perform such test periodically (minimum once in a year) during the guarantee period or as directed by the Engineer-in-charge or GIDC.

The contractor's scope of work does not include the damages caused by the following and contractor will not be liable for the same.

- Damages caused by External fire, mishandling or physical breakage due to mishandling or damages to the building due to any other reasons.
- Damages caused by natural disaster which includes Flooding, heavy rains,
- Earthquake, volcano, cyclone, lighting strike
- Damages caused by rioting, arsoning.

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3) **Surveying & measuring equipment:**

Equipment for surveying & measurement on the work shall be procured by the contractor for his use. The same also is made available to the Engineer at site or any work connected with the contract without any additional charges.

4) **Units rates under Schedule "B" :**

The Unit rates specified for various items to be executed as per Schedule "B" attached with the Price Bid are inclusive all labours, materials, testing charges, equipment, all incidental charges involving in the work and as specified in the Mode of measurement & payment of detailed specifications of items incl. all taxes, royalty, octroi, transportation cost etc. all as applicable presently as to be enforced for future by any / all including Central/State Government & Statutory bodies from time to time.

5) **Performance Bond of Nationalized / scheduled Bank :**

The contractor shall have to execute the Maintenance Bond of Nationalized /schedule bank or any approved bank by government's latest GR in the given format attached herewith or in the format as approved by the Corporation and shall be for validity period of **15 months** with effect from date of work order. The banker shall confirm this every year.

N.S.C./F.D./S.S.N.N.L. shall also be acceptable in favor of Executive Engineer, GIDC, Ankleshwar.

6) **Others :**

- In all the items of Schedule "B", the thickness mentioned is compacted thickness to be considered for the purpose of measurements and payments.
- The contractor document shall include the original tender papers of GIDC, submission of contractor negotiation letter, letter of acceptance, agreement in B-2 form and the work order.
- All applicable taxes incl. GST will be the responsibility of the bidder. Any amount for taxes and GST will not be paid to the bidder by GIDC.

The contractor shall exhibit a board as per requirement of GIDC with detailed specification and details of work and amount at site at his own cost as directed by the Engineer-in - charge.

- 7) GIDC will deduct 1% of the Estimated Cost from each Running Account Bill against the testing charges of materials brought on site. **(As per Clause no.76 of B-2 Agreement of R&B Department)**

8) **Vehicle Facility for Engineer-in-charge / Supporting Staff:-**

As directed by Engineer-in-charge from the date of work order till the completion of work, Contractor shall provide 1 Nos., 4+1, private or taxi passing A.C. vehicle for Engineer-in-charge / Supporting Staff at site for 24 hours with driver at free of cost for limited to 2500 Km per month for each vehicle.

9) **Site office accommodation: -**

As directed by Engineer-in-charge, the contractor shall provide and maintained well-furnished site office, having approximate area 36 sq. mtr. and including all required tools and plant, computer with printer, internet facilities etc. on site for

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GIDC officials. The agency has to arrange at his own cost a properly covered site office for GIDC Officials / staff having min. size of 6mt x 6mt with all required Furniture, Toilet facility, Latest updated version Computers (P-4 or above) with Internet facilities, Laser Printers with required stationary, Cupboards, Mineral Waters etc. from the starting date of contract and to maintain till completion of the work satisfactorily.

- 10) If quantity of any item of BOQ of tender is not executed due to dispute of land or any other reason, then GIDC will not pay any compensation. For that bidder cannot approach to the Court/Arbitration for financial implication against GIDC in this regard.

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## PRE-QUALIFICATION APPLICATION

- (1) Following constitution of Pre-Qualification evaluation committees is finalized.

### Statement 1.1

Sr. No.	Constitution of Committee
1.	<b>Committee Of the Chief Engineer as under.</b> 1) Chief Engineer - Chairman 2) Chief Account Officer – Member 3) SuperintendingEngineer(HO) – Member 4) SuperintendingEngineer(M&E) - Member 5) SuperintendingEngineer(CG), Bharuch- Member

- (2) Prequalification criteria for the Civil / Mechanical / Electrical works.

(2.1) Eligibility: -

(2.1.1) Bidder's registration: -

(2.1.1.1)

- (I) Only those bidders shall bid whose names are borne on the approval list of registered contractors in **“B” Class & above** with Gujarat state R&BD / W.R.D. / GIDC.

(2.1.1.2) If the Contractor's registration in the required class & category with Gujarat state R&BD/W.R.D./ GIDC is expired on or before the last date of online bidding period of the tender, the bidder must submit through online in electronic form the application for renewal of the same with the concerned department along with receipt of fees paid for it. In such cases, the bidder at his own responsibility must produce valid renewed registration certificate in the required class & category with Gujarat state R&BD/W.R.D./GIDC before the date of opening of technical bid. Failing to which the bidder shall be disqualified for opening of his price bid. Bidder will solely be responsible for obtaining the required registration.

(2.1.1.3) In context to above Para (2.1.1.2), it is clarified that the bidder who is having registration in class & category below than the minimum required class & category and the bidder have applied for up-

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gradation in required class and category with Gujarat state R&BD/ W.R.D. / GIDC shall not be considered valid. In such cases the bidder shall not be considered eligible for bidding.

- (2.1.1.4) The bidder, who is registered in appropriate category of C.P.W.D., M.E.S., Railways and Indian state government, can also bid provided the bidder produce such registration certificate at the time of bidding and obtain registration in required class & category from the Gujarat state R&BD / W.R.D. / GIDC before issuing work order. Bidder will solely be responsible for obtaining the required registration.

**Note :- Joint Venture (JV) is not allowed.**

**(2.2) Annual Turn Over :**

- (2.2.1)** Average **Updated** Annual Financial Turnover during the last three years, i.e. 01/04/2023 to 31/03/2026 financial year shall be at least 30 % of the estimated cost, i.e. **Rs.78.79 Lakhs.**
- (2.2.2)** For arriving at update value, total amount of Turn Over of any one financial year shall be multiplied by the enhancement factor corresponding to that financial year. Following enhancement factor will be applied to total amount of Turn Over in any one financial year and to bring them to the base year.

Year	Financial year	Enhancement factor
<b>Base(year of inviting tender)</b>	<b>2026 to 2027</b>	<b>1.00</b>
<b>-1</b>	<b>2025 to 2026</b>	<b>1.10</b>
<b>-2</b>	<b>2024 to 2025</b>	<b>1.21</b>
<b>-3</b>	<b>2023 to 2024</b>	<b>1.33</b>

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**(2.3) Successful experience:**

(2.3.1) The bidder must have completed at **least Single work** involving component of construction of Rigid pavement involving item of Dry Lean Concrete (DLC) & Pavement Quality Concrete (PQC) work having updated completion cost not less than Rs. 210.12 lakhs. (80 % of Estimated Cost)

OR

The bidder must have completed at **least Two Different work** involving component of construction of Rigid pavement involving item of Dry Lean Concrete (DLC) & Pavement Quality Concrete (PQC) work having updated completion cost of each work not less than Rs. 131.33 lakhs. (50 % of Estimated Cost)

OR

The bidder must have completed at **least Three Different work** involving component of construction of Rigid pavement involving item of Dry Lean Concrete (DLC) & Pavement Quality Concrete (PQC) work having updated completion cost of each work not less than Rs.105.06 lakhs. (40 % of Estimated Cost)

(2.3.2) For arriving at update value, final amount of the work, completed in any one financial year shall be multiplied by the enhancement factor corresponding to that financial year. Following enhancement factors will be applied to final amount of work, completed in any one financial year and to bring them to the base year. The current financial year in which bid is invited shall be considered as the base year.

Year	Financial year	Enhancement factor
<b>Base (Year of inviting tender)</b>	<b>2026 to 2027</b>	<b>1.00</b>
<b>-1</b>	<b>2025 to 2026</b>	<b>1.10</b>
<b>-2</b>	<b>2024 to 2025</b>	<b>1.21</b>
<b>-3</b>	<b>2023 to 2024</b>	<b>1.33</b>
<b>-4</b>	<b>2022 to 2023</b>	<b>1.46</b>
<b>-5</b>	<b>2021 to 2022</b>	<b>1.61</b>
<b>-6</b>	<b>2020 to 2021</b>	<b>1.77</b>

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-7	2019 to 2020	1.95
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A work would qualify as similar work only if it meets with definitions given in below **Appendix-A**.

## APPENDIX-A

### (2.3.2.1) DEFINITION OF SIMILAR WORK

The bidder must have completed at **least Single work** involving component of construction of Rigid pavement involving item of Dry Lean Concrete (DLC) & Pavement Quality Concrete (PQC) work having updated completion cost not less than Rs. 210.12 lakhs. (80 % of Estimated Cost)

OR

The bidder must have completed **at least Two Different work** involving component of construction of Rigid pavement involving item of Dry Lean Concrete (DLC) & Pavement Quality Concrete (PQC) work having updated completion cost of each work not less than Rs. 131.33 lakhs. (50 % of Estimated Cost)

OR

The bidder must have completed **at least Three Different work** involving component of construction of Rigid pavement involving item of Dry Lean Concrete (DLC) & Pavement Quality Concrete (PQC) work having updated completion cost of each work not less than Rs.105.06 lakhs. (40 % of Estimated Cost)

### (2.4) Bid Capacity:

(2.4.1) The bidder must have available bid capacity (ABC) more than the amount put to tender. (Rs.02,62,65,315.28)

$$ABC = 2 * A * N - B$$

Where,

A is the maximum of updated total amount of works executed in any one year of the last five financial years i.e. from Dt.01/04/2021 to Dt.31/03/2026.

N is the number of years prescribed for completion of the proposed work.

B is the amount of the exiting commitments and on-going works to be discharged during time interval of N years from the bid due date. As per following schedule-E.

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### SCHEDULE-E

#### “EXPERIENCE ALL PROJECTS IN PROGRESS”

Give information about all projects which are in progress including the company has received a letter of intent / acceptance but a formal contract has not yet been awarded.

Employer	Engineer responsible for supervision	Location & description of works	Value of contract	Cost of work executed as on date of this bid	Remaining work to be executed as on date of this bid	Percentage of practical completion	Date of work order	Stipulated date of completion of work	Likely date of completion	Reasons for slow progress, if any.
1	2	3	4	5	6	7	8	9	10	11
Total										

**Note:** -Non-disclosure of any information in the schedule will result in disqualification of the bidder.

(Signature of bidder)

**(2.4.2)** For the purpose of updating amount of works executed in any year, procedure narrated as under shall be applied.

**(2.4.3)** For arriving at update value, total amount of works executed in any one year shall be multiplied by the enhancement factor corresponding to that year. Following enhancement factors will be applied to total amount of works executed in any one year and to bring them to the base year. The current financial year in which bid is invited shall be considered as the base year.

Year	Financial year	Enhancement factor
Base (year of inviting tender)	2026 to 2027	1.00
-1	2025 to 2026	1.10
-2	2024 to 2025	1.21

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-3	2023 to 2024	1.33
-4	2022 to 2023	1.46
-5	2021 to 2022	1.61

- (2.4.4)** Existing commitments shall include all such works for which letters of acceptance of the tenders have been received by bidder till the date on which bidder has submitted his bid for the proposed work.

**2.5. Litigation history:**

- (2.5.1)** The applicant should provide accurate information on litigation and/or arbitration resulting from contracts completed or under execution by him over the last five financial years. A consistent history of arbitration awards/judgments against the applicant or any partner of a joint venture may result in disqualification for proposed work. If the details of litigation history is hidden by the applicant and later on it comes to knowledge of the employer the bidder shall be disqualified for the proposed work and other appropriate action shall be taken against the bidder.

- (2.5.2)** Information of litigation history in following statement to be submitted, if any other wise Nil / Not Applicable statement to be submitted.

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**LITIGATION HISTORY****Name of Applicant :-**

Sr. No.	Name of Contract	Work Completed or Under Execution	Financial Year	Brief Detail of the arbitration / Litigation Matter	Department in Opposition	Whether awards / Judgements is pending or made?	Details of result of Arbitration / Judgement	Whether Judgement in Favour or in Against

(Signature of bidder)

**(2.6) Affidavit regarding Termination / Blacklisting / Ban / Registration kept in Abeyance. :-**

(2.6.1) The bidders shall be disqualified for opening of his price bid if he is under blacklist and / or under ban and /or his registration is under abeyance by any Central / State Government Department, Board, Corporation, Municipal Corporation, Municipality, Government Local Bodies, University etc.

(2.6.2) The bidder shall have to submit prescribed notarized affidavit on appropriate stamp paper as under, failing to which the bidder shall be disqualified for opening of his price bid.

**Affidavit regarding Termination / Blacklisting / Ban / Registration kept in Abeyance.**

(To be submitted on Rs.300/- stamp paper &amp; duly notarized.)

**Name of work :-****Tender ID :-**

I, \_\_\_\_\_, Age, \_\_\_\_\_, Resident of, \_\_\_\_\_ in the capacity of \_\_\_\_\_ Do hereby solemnly affirm and declare as under.

We are not under blacklist and / or under ban and /or our registration has not been kept under abeyance by any Central / State Government

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Department, Board, Corporation, Municipal Corporation, Municipality, Government Local Bodies, University etc. as on date of participating for this bid.

Date :-

Authorized signatory

Place :-

**(2.7) Machinery / Equipment: -**

Bidder shall have to submit a prescribed notarized undertaking on Rs.300/- stamp paper for deploying machinery/equipment for the work under tender as per below.

**Undertaking for deploying Machineries/Equipment/Tools & Plants**

(To be submitted on **Rs.300/-** stamp paper & duly notarized.)

Name of Work: -

Tender ID: -

**APPENDIX - B**

Indicative List of minimum Plant & Equipment to be deployed on Contract Work.

Sr. No.	Type of Equipment	Minimum No. of equipment required
1	Tipper Trucks	6 No.
2	Motor Grader	1 No.
3	Vibratory Roller	2 No.
4	Dozer	1 No.
5	Front end Loader	1 No.
6	Tandem Roller	1 No.
7	Concrete paver capable of paving 7.5 meter with extensible to 10 m in one single pass including all accessories. Such as automatic dowel bar insertor integral vibratory system and electronic sensors ancillary equipment for applying curing compound, joint cutting etc.	1 No.
8	Smooth Wheeled Roller	2 No.
9	Needle Vibrator	2 No.
10	Water Tanker	2 No.
11	Concrete batching mixing plant (Minimum Capacity – 100m <sup>3</sup> / Hour)	1 No.
12	3 phase DG SET	1 No.
13	Welding Machine	1 No.
14	Levelling instruments (including Square level with allied accessories )	1 No.
15	Crane	1 No.

I/We hereby undertake that if I/we awarded the above said work then I/we shall deploy all Machineries/Equipment/Tools and Plants etc. as shown in the Appendix-B in fully working

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condition and utilize the same while execution of the work.

We also undertake that i/we shall deploy other Machineries/Equipment/Tools and Plants etc. over and above shown in Appendix-B in working condition and utilize the same as per instruction of Engineer-In-Charge.

Failing to above we shall not object any action taken against us within the tender provision.

In case of any dispute, Superintendent Engineer's decision shall be final.

Date :-

**Authorized signatory**

Place :-

**(2.8) Bidding in E-tendering :-**

(2.8.1) Submission of documents must be through e-tendering i.e. electronic form, unless specified in Para (2.9).

(2.8.2) All of the online submitted documents must be clearly readable, failing to which the same shall be considered as void.

(2.8.3) Bids of those bidders who have submitted all information, statistical details as required in the bid documents through E-Tendering will only be considered. If the employer desires any clarification, for verification/clarification, ambiguity of difference found in the documents/statistical details submitted online (by e-tendering) by the bidder the same shall be furnished within stipulated time otherwise further processing will be carried out in absence of above and the bidders shall be liable for any consequence.

(2.8.4) No bidder can participate in more than one bid for proposed work.

**(2.9) Submission of documents :-**

(2.9.1) Following documents/papers shall form part of the bid & must be submitted through online in electronic form unless specified separately, failing to which the bidder shall be dis-qualified for opening of his price bid.

(2.9.1.1) D.D. of require tender fee. (To be submitted in electronic form at the time of online submission of the bid & the same to be submitted in original during prescribed time period for submission of documents in physical form.)

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- (2.9.1.2) DD/FDR & BG of required EMD. (To be submitted in electronic form at the time of online submission of the bid & the same to be submitted in original during prescribed time period for submission of documents in physical form.)
- (2.9.1.3) Copy of valid bank solvency certificate of minimum 20 % amount of the estimated cost put to the tender of the work. (Bank Solvency certificate issued during current calendar year is considered as valid up to end of the December of the current calendar year. 31<sup>st</sup> march of the next calendar year. In case, where solvency certificate is not obtained in time, the certificate of previous year will be considered valid up to the end of March of current calendar year. In some certificates date of validity is stated. In such cases the same stated date is considered for validation instead of end of December of the current calendar year.)
- (2.9.1.4) Copy of relevant required Registration Certificate / Certificates. (In case of renewal, copy of application & receipt of fee paid.)
- (2.9.1.5) Copy of annual turnover certificate issued by chartered accountant for last three financial years. (If turnover of any of the last three financial years is not shown in the certificate then the same shall be considered as NIL and accordingly average annual turnover of last three financial year/years shall be calculated.)
- (2.9.1.6) Copy of form-3A / Experience certificate issued by employer (Government / Semi Government) showing all details as required as per Pre-Qualification criteria of successful experience of similar work and copy of letter of permission given by employer (Government / Semi Government) for subletting the work, if case may be of.
- (2.9.1.7) when employer is not a government, following need also to be furnished.
  - (2.9.1.7.1) Copy of work order.
  - (2.9.1.7.2) Copy of agreement.
  - (2.9.1.7.3) Copy of Form-3A / Experience certificate showing all relevant details issued by employer & certified by Chartered Accountant.
  - (2.9.1.7.4) Copy of final bill.
  - (2.9.1.7.5) Copy of TDS certificates.
  - (2.9.1.7.6) Copy of letter of permission given by employer for subletting the work.
- (2.9.1.8) Copy of annual total amount of works executed certificate issued by chartered accountant for last five financial years. (If annual total amount of works

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executed of any or some of the last five financial years is not shown in the certificate then annual total amount of works executed of financial year/years which has been shown in the certificate shall only be considered.)

(2.9.1.9) Schedule-E "Experience all projects in progress" as under in prescribed format as Per Para (2.4).

(2.9.1.10) Litigation history as per Para (2.5).

(2.9.1.11) Affidavit regarding Termination / Blacklisting / Ban / Registration kept in Abeyance as per Para (2.6).

(2.1.1.12) The undertaking for deploying machinery/equipment for the work under tender as per Para (2.7).

(2.9.1.13) MOU & all relevant required documents of MOU agency.

**(Note :-** The MOU must be submitted in prescribed format as incorporated in the approved D.T.P.& to be executed on relevant valued stamp paper & duly notarized.)

(2.9.2) Following documents/papers shall also form part of the bid, but these documents are not mandatory to be submitted through online in electronic form. However, the same shall be submitted in physical form, if not submitted through online in electronic form, within time period given by authority holding the digital key, failing to which the bidder shall be dis-qualified for opening of his price bid.

(2.9.2.1) Copy of registration certificate of firm / documents of public limited / private limited / partnership firm / proprietor firm, whichever is applicable. For example, Partnership Deed, Certificate of incorporation, Memorandum of association, Article of Association etc.

(2.9.2.2) Copy of Power of Attorney, if any.

(2.9.2.3) Copy of PAN Card.

(2.9.2.4) Copy of latest income tax return certificate. (Note :- latest income tax return certificate means the income tax return certificate of the last completed financial year for which pre-determined/extended time period by the Income Tax Department for filing income tax return is over on or before last date of online submission.

(2.9.2.5) Copy of Goods & Services (G.S.T.) registration certificate.

(2.9.2.6) Copy of RPFC registration certificate.

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- (2.9.2.7) Copy of RPFC Challan of any of the completed last three months from the month of last date of online submission of the tender.
- (2.9.3) Following Undertaking / Declaration to be incorporated on **(n) Procure website** in such a manner that without attending this undertaking / declaration the tender cannot be uploaded.

**UNDERTAKING / DECLARATRION**

"I hereby declare that I have after thoroughly understand the Pre-Qualification criteria / conditions and the details filed & documents submitted are true and correct to the best of my knowledge and belief. I shall not have any objection against any action taken by GIDC if any of the information submitted is found to be incorrect / false."

- (2.9.4) Any information, data, statistics etc. which are not related to bid document will not be considered in evaluation even through furnished by the applicant.
- (2.9.5) In accordance with stipulated of Para (2.8), employer reserves the right to call any information/documents which is mandatory, essential and critical for the purpose of evaluation. Any information provided by the applicant after last date of electronic submission will not be considered in evaluation, unless except the employer has specially asked for any information/document, which is mandatory, essential and critical for evaluation of PQ document. If required information is not furnished within stipulated time, proposal will be liable for rejection.
- (2.9.6) If any of the information provided by the bidder is found false during scrutiny or at the later stage, his EMD shall be forfeited and he shall be disqualified for the proposed work. In case when bidder has furnished exemption certificate in lieu of EMD, an amount equal to EMD shall be appropriated from his FDR pledged to avail of exemption certificate. If any of the information provided by the bidder is found false after award of work, the performance security of the bidder shall be forfeited and the contract shall be terminated.
- (2.9.7) Authority holding the digital key ((n) code solution), respective Executive Engineer of Civil branch, respective Executive Engineer of M&E branch and Account Officer / Divisional Accountant of the respective Division office shall be jointly liable to download, evaluate, verify all online documents submitted by the bidder with respect to Pre-Qualification criteria.

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- (2.9.8) In case of committee of Chief Engineer, concerned field Superintending Engineer and Concerned field Executive Engineers (Civil) & (M&E), after carried out all above procedures and verifying all print outs of the online documents submitted by the bidders, shall submit the same documents (Indicating page no. on each & every documents submitted by the bidder through online in electronic form.) along with evaluation sheet (Details against each P.Q. Criteria along with page No., remarks etc. **Note :-** To be prepared by respective Executive Engineer of Civil branch, respective Executive Engineer of M&E branch and Account Officer / Divisional Accountant of the respective Division office jointly), duly signed by all the concerned, to Chairman (i.e. Chief Engineer) of the Pre-Qualification committee and also shall brief the other members of the Pre-Qualification committee on documents submitted by the bidders through online in electronic form and evaluation done by his office, at the time of meeting of the Pre-Qualification committee.
- (2.9.9) In case of committee of Superintending Engineer, concerned field Executive Engineer (Civil) & (M&E) and Account Officer/Divisional Account jointly, after carried out all above procedures and verifying all print outs of the online documents submitted by the bidders, shall submit the same documents (Indicating page no. on each & every documents submitted by the bidder through online in electronic form.) along with evaluation sheet (Details against each P.Q. Criteria along with page No., remarks etc.), duly signed by all the concerned, to Chairman, (i.e. Superintending Engineer) of the Pre-Qualification committee and also shall jointly brief the Chairman of the Pre-Qualification committee on documents submitted by the bidders through online in electronic form and jointly evaluation done by them, at the time of meeting of the Pre-Qualification committee.
- (2.9.10) Accordingly, concerned Pre-Qualification committee shall decide to qualify / dis-qualify the bidder & circulate / issue minutes of the meeting to concerned for further action.

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## ANNXURE - I

### Form of Bank Guarantee (Earnest Money Deposit)

Whereas M/s. .... (Hereinafter called Bidder) is desirous and prepared to tender for work in accordance with terms and conditions of Tender No. .... dated ..... And whereas we ..... Bank, agree to give the Bidder a Guarantee for the Earnest Money Deposit.

1. Therefore, we here by affirm that we are Guarantors on behalf of the Bidder upto a total of Rupees ..... (i.e. Rs. ....) and we undertake to pay the Executive Engineer, Gujarat Industrial Development Corporation, Bharuch, upon his first written demand and without demur, without delay and without necessity of previous notice of individual or administrative procedure and without necessity to prove the bank the defects or short coming or debit of the bidder any sum within the limit of Rupees.....
  
2. We further agree that the guarantee here in contained shall remain in full force and effect during the period that would be taken for the acceptance of tender. However, unless a demand or claim under this guarantee is made only in writing on or before the ..... We shall be discharged from all liabilities under the guarantee there after.
  
3. We undertake not to revoke the guarantee during its currency except with the previous consent of the Executive Engineer, Gujarat Industrial Development Corporation, Bharuch, in writing.
  
4. We lastly undertake not to revoke the guarantee for any change in constitution of the Bidder or the Bank.

Signature and Seal of Guarantor

Date :

Bank :

Address :

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## **APPENDIX – C**

### **SELF EVALUATION FORM**

Sr. No.	Component	Requirement as per tender	M/s. ....				Page No.	Remarks
			DETAILS FURNISHED BY BIDDER					
1	Tender Fees including GST	Rs.4248.00/- by DD	Name of Bank					
			D.D. No. and Date					
			Amount in Rs.					
2	EMD (Rs.2,62,654/-)	(A) Rs.50,000.00 by DD / FDR	Name of Bank					
			D.D. / F.D.R. No. and Date					
			Amount in Rs.					
		(B) Rs.2,12,654.00 by B.G. (Schedule or Nationalized Bank Only)	Name of Bank					
			B.G. No. and Date					
			Valid up to Date.					
			Amount in Rs.					
3	Bank Solvency Certificate	20% amount of Estimated Cost i.e. Rs.52,53,065.00 (Refer Para 2.8.1.3)	Name of Bank					
			Amount in Rs.					
			Date of Issue					
			Valid up to Date.					
4	Registration certificate & special category (Civil)	(A) "B" Class & Above	Name of Department					
			Valid up to Date.					
			Authority					
5	C.A. Certified and copy of Annual Turnover for Last Five Financial Years	Average updated Annual Financial Turnover during the last three year shall be at least Rs. 78.80 Lakh (i.e. 30 % of the estimated cost.) (Refer Para 2.9.1.5)	Year	Financial year	Enhancement Factor	Turn Over		
			Base (year of inviting tender)	2026-2027	1.00			
			-1	2025-2026	1.10			
			-2	2024-2025	1.21			
			-3	2023-2024	1.33			
6	Successful Experience of Similar Work: copy of completion work. (Form 3A) must submit by the bidder. (As per Appendix - A)	Successful Experience of Similar Work: (Civil Work) As per Appendix - A	Road work					
			Name of work					
			Date of Completion					
			Amount of Work (Rs. Lakh)					
			Enhancement Factor					
			Updated Amount (Rs. Lakh)					
			Name of Department and Authority					
			Private work details					
			Copy of work order					
			Copy of aggrement					
			Copy of form 3A					
			Copy of final bill					
			Copy of TDS					

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			Copy of letter of permission given by employer for subletting the work			
			Date of Completion			
			Amount of Work (Rs. Lakh)			
			Enhancement Factor			
7	Experience all projects in progress"- SCHEDULE-E		(Refer Para 2.4)			
8	Litigation History		(Refer Para 2.5)			
9	Affidavit regarding Termination / Blacklisting / Ban / Registration kept in Abeyance		(Refer Para 2.6)			Details shall be given on Rs. 300/- stamp paper duly notarized
10	Machinery/Equipment: Proof of deployment of required minimum machinery / equipments mentioned in Appendix – B		(Refer Para 2.7)			Details shall be given on Rs. 300/- stamp paper duly notarized
11	Registration certificate / Documents of /public Limited / Private Limited/ Partnership deed / Proprietor Firm.		To be furnished whichever is applicable			
12	Power of Attorney					
13	<b>Bid Capacity</b> $ABC=2*A*N-B$  A = Maximum updated total amount executed in any <b>one year from 2021-22 to 2025-26</b>  N = 0.75 (Time Limit 09 Months ) is the number of years prescribed for completion of the proposed work. B is the amount of the existing commitments and ongoing works to be discharged during time interval of N years from the bid due date. As per following schedule E. The bidder must have Available Bid Capacity (ABC) more than the tender amount i.e. Rs. 02,15,63,470.00		<b>A=</b> <b>N=</b> <b>B=</b> <b>ABC =</b>			
14	C.A. Certified copy of Annual <b>work execution amount</b> for Last Five Financial Years (For Bid capacity )	<b>Year</b>  Base (Year of inviting tender) -1 -2	<b>Financial Year</b>  2026-2027 2025-2026 2024-2025	<b>Enh. Factor</b>  1.00 1.10 1.21	<b>Updated value of turn over (Lacks)</b>	

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		-3	2023-2024	1.33			
		-4	2022-2023	1.46			
		-5	2021-2022	1.61			
15	Latest Income tax return filed and PAN Card Details	(A) Year of Income tax Return filed	Assessment Year				
			Name				
		(B) PAN Card No.	PAN Card No.				
			Name				
16	Goods and Service Tax (GST) Number	GST No.	GST No.				
			Name				
17	RPFC Registration certificate & RPFC Challan	(A) RPFC Registration Certificate No.					
		Name					
		(B) RPFC Challan of any of the completed last three months from the monthh of last date of submission of the tender.					
		Name					
18	Undertaking / Declaration	Truth fullness certificate					
19	Other Remarks						
20	Whether Qualified or not?						

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## **GENERAL TECHNICAL SPECIFICATION**

**Name of work :** Work of Construction of PQC approach road with SWD from NH-48 at GIDC, Ankleshwar. (Re-invited)

### **1) GENERAL :**

These specifications apply to all such roads and other its related works as are required to be executed under the contract or otherwise directed by the Engineer-in-charge. In every case, the work shall be carried out to the satisfaction to the Engineer and confirm to the location, lines, dimensions, grades, & cross section shown on the drawing or as indicated by the Engineer.

The quantity of materials, processing of materials as may be needed at the site, silent feature of the construction work and quality of finished work shall comply with the requirements set forth in succeeding section, where the drawing and specification describe a portion of the work in only general terms and not in complete detail it shall be understood that only the best general practice to prevail, materials and workmanship of the best quality are to be employed and instruction of the Engineer are to be fully complied with.

A list of Indian Road Congress Specifications, Recommended code of practice and specification of Road and Bridge works (Ministry of Road Transport & Highways) published by I.R.C. etc., which have been made use of in the preparation of these specifications.

The latest edition of all specifications / standards till 30 (thirty) days before the final date of submission of tender, shall be adopted.

### **2) DEFENITIONS :**

The words like contract, contractor / binder , Engineer (Synonymous) with Engineer-in-charge, drawings, employer, Government, G.I.D.C, DIA ., Works & work site used in this specifications shall be considered to have the meaning as understood from the definitions of these terms given in the General condition of contract.

The following abbreviations shall have the meaning as set forth below :

ASTM	:	American Society for Testing and Materials.
BS	:	British Standard published by the British Standards Institutions.
CBR	:	California Bearing Ratio
IRC	:	Indian Road Congress.
IS	:	Indian Standard published by the Bureau of Indian Standards.

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MORT & H: Ministry of Road Transport & Highways – Specifications for road and bridge works published by the I.R.C.

PWD : Public Works Department.

### **3) MATERIAL & TEST STANDARDS :**

The relevant standard of material as well as the testing procedures, have been indicated at appropriate place in the specification or standard books of I.R.C./I.S code/MORT & H.

### **4) SIEVE DESIGNATION :**

The sieve designation referred to the specification correspondence to those specified by Bureau of Indian Standard in I.S. 460.

### **5) SCOPE OF WORK :**

The work to be carried out under the contract shall consist of the various items as generally described in the tender documents as well as in the bill of quantities furnished in the tender documents.

The work to be performed shall include all general works, preparatory to the construction of road and all other related works. The work shall include work of any kind necessary for the due and satisfactory construction, completion and maintenance of the works to the intent and meanings of the drawings and these specification and further drawings and orders that may be issued by the engineer from time to time.

The scope of work shall include compliance by the contractor with all general condition of contract, whether specifically mentioned or not in the various clauses of these specifications, all materials, apparatus, plant, equipment, tools, fuel, watering, strutting, timbering, transport, offices, stores, workshop, staff, labour and provision of proper and sufficient protective work, diversions, temporarily fencing & lighting. It shall also include : Safety of workers, first-aid equipments, suitable accommodation staff and workman with adequate sanitary arrangement, the effecting and maintenance of all insurance, the payment of all wages, salaries, fees, royalties, duties, or other charges arising out of the erection of the work and the regular clearance of rubbish, reinstatement and cleaning up of the site as may be required on completion of works, safety of the public and protection of the works and adjoining land.

The contractor shall ensure that all actions are taken to built in quality insurance in the planning and execution of the work. The quality insurance shall cover all stages of work, such as setting out, selection of materials, selection of construction method, selection of equipment and plant, deployment of personnel and supervisory staff, quality, control, testing etc. The work of building in quality insurance shall be deemed to be covered in this scope of the work.

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## 6 ) REFERENCE STANDARD BOOKS:

The work included in this contract, shall be carried out in accordance with the specifications, rules and regulations as laid down in the books mentioned below:

- A. Specifications for Road & Bridge Works, Ministry of Road Transport & Highway published by Indian Road Congress - IVth revision or revised from time to time.
- B. For Drum mix plants and accessories to be used for the work shall be in conformity with the specifications prescribed vide Govt. of India M.O.S.T. circular No. RW/24011/2/89-RMP, dtd. 29/09/1989. The plant shall be equipped with all units and accessories as per latest I.S. :3056- 1995 & as amended from time to time.
- C. For paver finisher: Requirement for essential features for paver finisher: (As per M.O.S.T. specification-2<sup>nd</sup> Revision February-1998 or as revised from time to time) and as specified in the tender documents.
- D. Relevant I.S. and I.R.C. specified in specification of item.
- E. P.W.D. Hand Book Vol. I and II.

If the reference books quoted above fall short for the items quoted in the schedule of this contract, reference shall be made to Indian Standard Specification of the latest addition, If any of the items of this contract are not covered by reference books quoted above, details and specifications directed by the Supdt. Engineer, GIDC, shall be final.

This shall depend on the standard specifications followed in different countries of the World for the item concerned.

## 7) GENERAL CONDITION REGARDING USE OF EQUIPMENT ON WORKS:

In addition to the general conditions already indicated, the following conditions regarding use of equipment in works shall be satisfied.

- i. The contractor shall be required to give a trial run of the equipment(S) or establishing their capability to achieve the laid down specifications and tolerance to the satisfaction of the Engineer before commencement of the work.
- ii. All equipment provided shall be of proved efficient and shall be operated and maintained at all times in a manner acceptable to the Engineer.
- iii. All the plant / equipment to be deployed on the work shall be got approved from the Engineer for ensuring their fitness and efficiency before commencement of the work.
- iv. Any material or equipment not meeting the approval of the Engineer shall be removed from the site forthwith.
- v. No equipment or personnel will be removed from site without permission of Engineer.
- vi. The contractor shall also make available the equipment for site quality control work as directed by the Engineer.

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## **8) CONTRACT DRAWINGS :**

The contract drawings provided for tendering purpose shall be as content in the tender documents and shall be use as a reference only.

The two copies of the drawings, on the basis of which actual execution of the work is to proceed, shall be furnished free of cost to the contractor by the GIDC, progressively according to the work programme submitted by the contractor and accepted by the Engineer.

Examination and / or approval by the Engineer of any drawings or other documents submitted by the contractor shall not relieve the contractor of his responsibilities and liability under the contract.

## **9) PROGRAMMING:**

The Executive Engineer may at any time give directions as to the order & manner in which the several parts of the work shall be carried out. The contractor shall strictly observe such directions. The contractor shall at all time be responsible for any damage and trespass committed by his agent and working people in earring out the work unless trespass is authorized by the Executive Engineer is working.

## **10) PERMIT & LICENSE:**

The contractor shall procure at his sole expenses all permit & license & pay all charges and fee for lawful execution of the work.

## **11) INSPECTION OF WORKS & MATERIALS:**

For Site engineer, Agent & employees of the contractor shall provide safe and proper facilities.

1. The inspection of work shall not be relieved the contractor of his obligations to fulfill the terms of the contract as herein prescribed by the plans and specifications.
2. The Executive dates of work. The contractor shall furnish written information to the Executive Engineer, carting the original sources of supply and dates of manufacturing of all materials brought to site of the work.
3. In order to ensure a proper time sequence for required inspection and approval, this information shall be furnished at least two weeks or as directed by the Engineer-in-charge in advance of use or incorporation in the work of any such materials and this shall be given in written by the contractor.
4. Failure to reject any defective work or materials at any time will not in any way prevent later rejection when such defects is discovered or observed by the department to the final acceptance.

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**GENERAL SPECIFICATION FOR QUALITY CONTROL ON WORKS & MATERIALS:****(1) GENERAL**

- 1.1) The contractor shall be responsible for the quality of the work in the entire construction work within the contract. He shall, therefore, have his own independent and adequate set up for ensuring the same.
- 1.2) The contractor shall provide necessary co-operation and assistance in obtaining the samples for test and carrying out the field tests as required by the Engineer-in-charge from time to time. This may include provision of labour, attendance, assistance in packing and dispatch and any other assistance considered necessary in connection with the test.
- 1.3) All materials to be used, all method adopted and all works performed shall be strictly in accordance with the requirements of this specification. The contractor shall set up field laboratory at the location approved by the Engineer & equip the same with adequate equipment and personnel in order to carry out all required test & quality of control work as per specification or as directed by the Engineer-in-charge. The list of equipment & the facilities to be provided shall be got approved from the Engineer-in-charge in advance.
- 1.4) The contractor's laboratory should be manned by a qualified materials Engineers, Civil Engineers, assisted by experienced technicians & the set up should be got approved by the Engineer.
- 1.5) The contractor shall carry out quality control tests on the materials & work to the frequency stipulated in subsequent paragraphs. In the absence of clear indications about method and or frequency of tests for any item, the instructions of the Engineer shall be followed.
- 1.6) For satisfying himself about the quality of the materials & work, quality control test will also be conducted by the Engineer, and Corporation's quality control units or consultant as approved by the Corporation, generally to the frequency set forth herein under. Additional tests may be also conducted where, in the opinion of the Engineer, need for such test exists.
- 1.7) For the work of embankment, sub-grade, and pavement, construction of subsequent layer of same or other materials the finished layer shall be done after obtaining permission the Engineer. Similar permission from the Engineer shall be obtained in the respect of all other items of work prior to proceeding with the next stage of construction.
- 1.8) The contractor shall carry out modifications in the procedure of work if found necessary, as directed by the Engineer during inspection. Works failing short of quality shall be rectified / redone by the contractor at his own cost and defective work shall also be removed from the site of work by the contractor at his own cost.
- 1.9) For testing of samples of soil/soil mixes, granular materials, and mixes, bituminous materials & mixes, aggregates, course etc. samples in the required quality & form shall be supplied to the Engineer by the contractor at his own cost.
- 1.10) For cement, quarry spauls, aggregate, bitumen, mild steel similar other materials where essential tests are to be carried out at the manufacture's plant or at laboratory

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other than the site laboratory, the cost of samples, sampling, testing, and furnishing of test certificate . He shall also furnish the test certificate to the Engineer.

- 1.11) The contractor should not that materials other than site laboratory shall be tested in Govt. recognized laboratory at his own cost.
- 1.12) For testing of cement concrete at site during construction, arrangement for supply of samples, sampling, testing & supply of test results shall be made by the contractor as per the frequency and number of test specified in the Hand book of Quality control for construction of roads and runways (IRC Special publication No.11), and the Ministry of Shipping & Transport Specifications and where the same are silent, as per the relevant IRC Standards, specifications, guidelines, Special publications and IS Standards. In the absence of relevant Indian standards, the sampling and testing procedure to be used shall be approved by the Engineer. Where the Engineer considers that in the interest of the Control of Quality on materials or workmanship, modifications, if any, are necessary, such modifications shall be carried out by the Contractor at no extra cost. The sampling and testing procedure to be used shall be approved by the Engineer and his decision shall be final and binding on the contractor.
- 1.13) The materials shall be tested in approved Laboratory other than site laboratory.
- 1.14) Norms for testing the Building Materials given in this volume shall also be followed.
- 1.15) The materials for embankment construction shall be got approved from the Engineer. The responsibility for arising & obtaining the land for borrowing or explore in any other way shall rest with the contractor who shall ensure smooth & uninterrupted supply of materials in the required quality during the construction period.
- 1.16) Similarly, supply of aggregates for construction of road pavement shall be from quarries approved by the Engineer. Responsibility for arising uninterrupted supply of material from the source shall be that of the contractor.

## **(2) DEFECTIVE MATERIALS:**

All materials, which the Engineer/ Q.C. unit of Corporation/ Third Party Inspector appointed by the Corporation has determined as not conforming to the requirements of the contract shall be rejected whether in place or not, they shall be removed immediately from the site as directed. Materials, which have been subsequent collected, shall not be used in the work unless approval is accorded in writing by the Engineer. Upon failure of the contractor to comply with any order of the Engineer/ Q.C. unit of the Corporation / Third Party Inspector appointed by the Corporation, given under this clause. Engineer/ Q.C. unit of the Corporation / Third Party Inspector appointed shall have authority to cause the removal of rejected material and to deduct the removal & allied cost thereof from any payments due to the Contractor.

## **(3) CONTROL OF ALIGNMENT, LEVELS & SURFACE REGULARITY.**

### **3.1) GENERAL:**

All works performed shall conform to the lines, grades, cross sections and dimensions shown on the drawings or as directed by the Engineer-in-charge subject to the permitted tolerances described hereinafter.

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### 3.2) HORIZONTAL ALIGNMENT:

Horizontal alignment shall be reckoned with respect to the centre line of the carriageway as shown on the drawings. The edges of the carriageway as constructed shall be corrected within a tolerance of  $\pm 10\text{mm}$  there from. The corresponding tolerance for edges of the roadway and lower layers of pavement shall be  $\pm 25\text{mm}$ .

### 3.3) LONGITUDINAL PROFILE:

The levels of the sub grade and difference pavement courses as constructed shall not vary from those calculated with reference to the longitudinal and cross profile of the road shown on the drawings or as directed by the Engineer-in charge, beyond the tolerance mentioned below:

1	Sub grade	+ 20mm - 25mm
2	Sub-base	+ 10mm
	(a) Flexible pavement	- 20mm
	(b) Concrete pavement	+ 6mm
3	<b>Sub-base for flexible payment</b>	
	(a) Bituminous course	$\pm 6\text{mm}$
	(b) Other than bituminous	
	(i) Machine laid	$\pm 10\text{mm}$
	(ii) Manually laid	$\pm 15\text{mm}$
4	<b>Wearing course of flexible pavement.</b>	
	(i) Machine laid	$\pm 6\text{mm}$
	(ii) Manually laid	$\pm 10\text{mm}$
5	Cement concrete pavement	$\pm 5\text{mm}$ - 6mm

Provided, however, that the negative tolerance for wearing course shall not be permitted in conjunction with the positive tolerance for base course if the thickness of the former is thereby reduced by more than 6mm for flexible pavement and 5mm for concrete pavement.

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

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

### 3.4) SURFACE REGULARITY OF SUB GRADE & PAVEMENT COURSES:

The surface regularity of completed sub-base, base courses and wearing surfaces in the longitudinal and transverse directions shall be within the tolerance indicated in

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Table-1.

The longitudinal profile shall be checked within a 3 meter long straight edge/ moving straight edge as desired by the Engineer, at the middle of each traffic lane along a line parallel to the centre line of the road. The maximum permitted number of surface irregularities shall be as per Table -1 below.

**TABLE-1 : MAXIMUM PERMITTED NUMBER OF SURFACE IRREGULARITIES**

	Surfaces of carriageways & paved shoulder				Surfaces of laybys Service area and all bituminous base courses			
<b>Irregularity</b>	4mm		7mm		4mm		7mm	
Length (M)	300	75	300	75	300	75	300	75
Double lane/single lane	20	9	2	1	40	18	4	2

The maximum allowable difference between the road surface & underside of a 3 mtr, straight edge when place parallel with or at right angles to the centre line of the road at points decided by the Engineer shall be :

For pavement surface (bituminous & cement concrete) 3 mm

For bituminous base courses 6 mm

For Granular sub-base/base courses 8 mm

For sub-bases under concrete pavements 10 mm

### **3.5) RECTIFICATION:**

Where the surface irregularity of sub grade and the various pavement courses fall outside the specified tolerance, the contractor shall be liable to rectify these in the manner described below and to the satisfaction of the Engineer-in-charge.

#### **(i) Sub grade:**

Where the surface is high, it shall be trimmed and suitably compacted. Where the same is low, the deficiency shall be corrected by adding fresh material. The degree of compaction and the type of material to be used shall conform to the relevant specifications.

#### **(ii) Granular/ Sub base:**

Same as at (i) above except that the degree of compaction and the type of material to be used shall conform to the relevant specifications.

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## 4.0) QUALITY CONTROL TESTS DURING CONSTRUCTION:

### 4.1) GENERAL:

The materials supplied and the works carried out by the contractor shall conform to the specifications prescribed in the preceding clauses.

For ensuring the requisite quality of construction, the materials and works shall be subjected to quality control tests, as described hereinafter by the Engineer-in-charge shall have the full authority to carry out tests as frequently as he may deem necessary to satisfy himself that the materials and works comply with the appropriate specification. Test procedure for the various quality control tests are indicated in the respective sections of the specifications or for certain tests within this section. Where no specific testing procedure is mentioned, the tests shall be carried out as per the prevalent accepted engineering practice to the directions of the Engineer in-charge.

### 4.2) TESTS ON EARTH WORK FOR EMBANKMENT CONSTRUCTION:

#### 4.2.1: Borrow materials:

- a) Sand content (I.S.:2720 -Part-4) : Two tests per 3000 cu.mts. of soil.
- b) Plasticity test (I.S.:2720-PART-5):Each type to be tested,2 tests/ 3000 M3 of soil.
- c) Density Test (I.S.:2720 -PART-8):Each type to be tested,2 tests/ 3000 M3 of soil.
- d) Each soil type to be tested, 2 tests per 3000 cu.mts.of soil.
- e) Deleterious content Test (I.S.:2720 -Part-27) as & when required by Engineer
- f) Moisture content Test (I.S.:2720 -Part-2)One test for every 250 M2 of soil.
- g) C.B.R. test on materials to be incorporated in the sub grade on soaked/ unsoaked samples (IS:2720-Part-16) one CBR test for every 3000 cu.mtr. at least or closer as and when required by the Engineer-in-charge.

#### 4.2.2.: COMPACTION CONTROL:

Control shall be exercised by taking at least one measurement of density for each 5000 square meters of compacted area or closer as required to yield the minimum number of test results for evaluating day's work on statistical basis. The determination of density shall be in accordance with I.S. :2720 -Part-28). Test locations shall be chosen only through random sampling techniques. Control shall not be based on the result of anyone test but on the mean value of a set of 5-10 density determinations. The number of test in one set of measurements shall be 6 (if nondestructive test are carried out, the number of test shall be doubled) as long as it is felt that sufficient control over borrow material and the method of compaction is being exercised. If considerable variations are observed between individual density results, the minimum number of tests in one set of measurement shall be increased to 10. The acceptance criteria shall be subject to the condition that the mean density is not less than specified density plus:

$$\frac{1.65 - 1.65}{(\text{No. of samples})^{0.5}} : \text{times the standard deviation.}$$

However, for earthwork in shoulders (earthen) and in the sub grade, at least, one density measurement shall be taken for every 500 square meters of the compacted area provided further that the number of tests in each set of measurements should

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be at least 10. In other respects, the control shall be similar to that described earlier.

#### 4.3) TESTS ON SUB BASE AND BASES & BITUMINIOUS WORKS:

The tests and their frequencies for the different types of bases and sub-bases shall be as given in TABLE-2. The evaluation of density results for compaction control shall be on lines similar to those set on in Clause-4.2.2.

**TABLE-2:CONTROL TEST & THEIR MINIMUM FREQUENCY FOR SUB-BASE / BASE / BITUMEN WORK.(As per MoRTH 5<sup>th</sup> revision , Table no-900-3 ,4& 6)**

**(Sr No. 10-15 given below are for frequency of quality control tests for pavement concrete)**

SR.NO.	TYPE OF CONSTRUCTION & MATERIALS.	TEST	FREQUENCY
1	E/w for embankment with excavated stuff / selected soil having MDD not less than 19.5 KN / m <sup>3</sup>	1) M.D.D. Test	As Required.
		2) Moisture content prior to compaction.	One Test per 200 m <sup>3</sup>
		3) Density of compacted layer.	One test per 500 m <sup>3</sup>
		4) Deleterious constituents.	As required.
2	Granular sub-base (Quarry spall)	1) Gradation	One test per 400 m <sup>3</sup>
		2) Atterberg limits	-do-
		3) Moisture content prior to compaction.	One test per 450 m <sup>3</sup>
		4) Density of compacted layer.	One test per 1000 Sq.M
		5) Deleterious constituents.	As required
		6) C.B.R. value	As required.
3	W.B.M.	1) Aggregates Impact value	One test per 1000 m <sup>3</sup> of aggregates.
		2) Grading	One test per 250 m <sup>3</sup>
		3) Flakiness index & elongation index (Total)	One test per 500 m <sup>3</sup> of Aggregate
		4) Atterberg limits of binding material.	One test per 50 m <sup>3</sup> of Binding Material
		5) Atterberg limits of portion of aggregate passing 425 micron sieve.	One test per 100 m <sup>3</sup> of aggregates.
4	Wet Mix Macadam	1) Aggregates Impact value	One test per 1000 m <sup>3</sup> of aggregates.
		2) Grading	One test per 200 m <sup>3</sup>
		3) Flakiness index & elongation index (Total)	One test per 500 m <sup>3</sup> of Aggregate
		4) Atterberg limits of portion of aggre. passing 425 micron sieve.	One test per 200 m <sup>3</sup> of Binding Material

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		5)	Density of compacted layer.	One test per 1000 m <sup>3</sup> of aggregates.
5	Paving Bitumen /bitumen emulsion		Nos. of tanker 1 2 to 15 16 to 50 51 to 150 151 to 500 Above 501	No. of test. 1 2 3 5 8 13
6	Prime coat / Tack coat	1 2 3	Quality of binder Binder temperature for application. Rate of spread of binder.	Two samples per lot to be subjected to all or some tests as directed by the Engineer As regular close intervals.  Three tests per day.
7	Surface dressing.	1 2 3 4 5 6 7 8 9 10 11. 12.	Quality of binder Agg. impact value / Los angles abrasion value. Flakiness index & elongation index Stripping value of aggregate. Water absorption of aggregates. Water sensitivity of Mix Grading of aggregate Temperature of binder at the time of application. Polishing stone value. Soundness (Magnesium & Sodium sulphate) Rate of spread of materials Percentage of Fractured phases.	Number of samples per lot and tests as per IS: 73, IS:217 and IS: 8887 as applicable. One test per 200 Cu.m of each source and whenever there is change in quality of aggregates. One test per 100 Cu.m of each source and whenever there is change in quality of aggregates. One test of each source and whenever there is change in quality of aggregates. -do- -do- Two test per day At regular close intervals.  One test of each source and whenever there is change in quality of aggregates. One test of each source and whenever there is change in quality of aggregates. Three test per day One test per 100 cu.mt of aggregate
8	B.M. &SDBC.	1 2	Quality of binder Agg.impact value / Los angles abrasion value.	Number of samples per lot and tests as per IS: 73, IS:217 and IS: 8887 as applicable. One test per 200 Cu.m of each source and whenever there is

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				change in quality of aggregates.
		3	Flakiness index & elongation index	One test per 350 Cu.m of each source
		4	Stripping value of aggregate. Water sensitive of mix .	Same as Mentioned under Serial No. 7
		5	Grading of aggregates.	Same as Mentioned under Serial No. 7
		6	Water absorption of aggregates.	Same as Mentioned under Serial No. 7
		7	Soundness ( Magnesium & sodium sulphate) Percentage of Fractured phases. Binder content & aggregate grading.	Same as Mentioned under Serial No. 7
		8	Control of temperature of binder & aggregate for mixing & of the mix at the time of laying & rolling.	Same as Mentioned under Serial No. 7
		9		Same as Mentioned under Serial No. 7
		10	Rate of spread of mixed materials.	Same as Mentioned under Serial No. 7
		11	Density of compacted layer.	Same as Mentioned under Serial No. 7
		12		1 test per 700 m2 area.
		13		At regular interval.
9	DBM / BC	1	Quality of binder	Number of samples per lot and tests as per IS: 73, IS:217 and IS: 8887 as applicable.
		2	Agg.impact value / Los angles abrasion value.	One test per 350Cu.m of each source and whenever there is change in quality of aggregates.
		3	Flakiness index & elongation index	One test per 350 Cu.m of each source and whenever there is change in quality of aggregates
		4	Soundness Test	One test of each source and whenever there is change in quality of aggregates.
		5	Water absorption of aggregates	One test of each source and whenever there is change in
		6		

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		7	Sand equivalent test.	quality of aggregates.
		8	Plasticity Index	One test of each source and whenever there is change in quality of aggregates.
		9	Polished stone Value	One test of each source and whenever there is change in quality of aggregates.
		10	Percentage of Fractured phases.	One test of each source and whenever there is change in quality of aggregates.
		11	Mix grading.	One test per 350 cu.mt of aggregates when crushed gravel is used
		12	Stability & Voids analysis of mix including theoretical maximum specific of loose mix	One set of tests on individual constituents and mixed aggregate from the dryer for each 400 tonnes of mix subject to minimum of two tests per plant per day
		13	Moisture susceptibility of mix	
		14	temperature of binder in boiler, aggregate in the dryer and mix at the time of laying and rolling	Three test for stability, flow value, density and void contents for each 400 tonnes of mix subject to a minimum of two tests per plant per day
		15	binder content	
		16	Rate of spread of Mix material.	One test for each mix type whenever there is change in quality of aggregates.
			Density of compacted layer.	At regular intervals.
				One set for 400 tones of mix subject to minimum of two tests per day per plant.
				After every 5th truck load
				One test per 700 sq.mt area
10	Cement	1)	Physical & chemical test. IS – 269,455,1489, 8112 & 12269.	Once for each source of supply and occasionally when called for in case of long/improper storage, Besides, the Contractor also will submit daily data on cement released by the Manufacturer.
11	Sand	1)	Silt content	1 sample per 150 m3
		2)	Fineness modules.	1 sample per 150 m3
		3)	Gradation	1 sample per 150 m3

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12	Course & fine aggregates.	1)	Gradation IS: 2386 (Part-1)	One test for every day's work of each section of course aggregate and fine aggregate as above or as approved by Engineer-in-charge.
		2)	Deleterious constituents IS: 2386 (Part-2)	-do-
		3)	Water absorption IS: 2386 (Part-3)	Regularly as required to a minimum of one test a day for course aggregate and two tests a day for fine aggregate and as directed by Engineer-in-charge.
13	Course aggregate	1)	Los angles abrasion value of aggregate impact value IS: 2386 (Part-4)	Once for each source of supply and subsequently on monthly basis.
		2)	Soundness IS: 2386 (Part-5)	Before approving the aggregates and every month subsequently
		3)	Alkali aggregate reactivity IS: 2386 (Part-7)	-do-
14	Water		Chemical test IS: 456	Once for approval of source of supply subsequently only in case of doubt or as directed by the Engineer-in-charge.
15	Concrete	1)	Strength of concrete IS: 516	As per frequency tests shown on the page No. 19 of B-2 agreement attached herewith.
		2)	Course strength on hardened concrete IS: 516	As per the requirement of Engineer.
		3)	Workability of fresh concrete – Slump test IS: 1199.	One test per each dumper load at both Batching plant site and paving site initially when work starts. Subsequently sampling may be done from alternate dumper.
		4)	Thickness determination	From the level data of concrete pavement surface and sub-base at grid points of 5/6.25 m x 3.5 m
		5)	Thickness measurement for trial length.	3 cores per trial length

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		6)	Verification of level of string line (SWD PCC lining work) and sub structure and structure (Head wall for CD works)	String line or steel forms shall be checked for level at an interval of 5 mtr. Or 6.25 mtr. The level tolerance allows shall be +/- 2mm. These shall be got approved 1-2 hours before the commencement of the concreting activity.
16	M.S./H.Y.S.D./TMT bars	1) 2) 3)	Ultimate tensile strength Yield stress (Proof stress) Percentage elongation	1 sample / 40 MT for each diameter.
17	Structural steel	1) 2) 3)	Ultimate tensile strength Yield stress (Proof stress) Percentage elongation	1 sample / 20 MT for each dimension of steel component
18	Bricks	1) 2)	Compressive strength Water absorption	1 Test / 50000 No. (5 bricks)
19	Plain tiles / mosaic tiles/flooring tiles/vitrified tiles/wall tiles	1) 2) 3)	Transverses strength Abrasion Water absorption	1 Test / 2000 No. (12 tiles)
20	Cement concrete cubes	1) 2)	Compressive strength for 7 days Compressive strength for 28 days	1 samples / 1-5 M3 2 samples / 6-15 M3 3 samples / 16-30 M3 4 samples / 31-50 M3 4+1 samples for each additional 50 M3 or part thereof.
22	Cement mortar	1)	Compressive strength	As per the requirement of Engineer

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## SPECIFICATION OF MATERIALS

### GENERAL :

- (1) All materials to be used shall conform to the relevant specifications as are per the latest edition of Indian Standard, unless otherwise stated in the detailed specifications of items of works.
- (2) All materials to be used shall be of approved quality & make as per list of approved make attached with the tender documents
- (3) Wherever to any Indian Standard appears in the specification, it shall be taken to mean as a reference to the latest version of the standard.
- (4) The following specifications, standards, and codes are made a part of this specification\Tender document.

Indian Standards : specification for building materials, specification for equipment, method of test, method of measurement of building works ,code of practice for construction , safety code for demolition of building, safety code for scaffolds etc. published by the Bureau of Indian Standards

Tests for materials shall invariably be got carried out by the contractor when the same are specified in the specifications tests shall also have to be carried out, even though the same are not specifically mentioned in the specifications. If the opinion of the EIC, the same are required to be carried out. All tests shall be got carried out in Government or in other approved laboratories and cost there of shall be entirely borne by the contractor.

- (5) The contractor shall invariably carry out Materials & work Tests as specified in the tender document **(B-2Form)** and IS code. However, if the additional tests are required as per the opinion of the Engineer-in-charge, the same shall also have to be carried out. All such tests shall be got carried out in Government or as approved laboratories and cost thereof shall be entirely borne by the contractor. No collection of materials shall be made before it is got approved from the EIC.
- (6) Collection of materials shall be done at site of work in a systematic manner. Materials shall be stored in such a manner as to prevent deterioration or intrusion of foreign matter and to ensure the preservation of their quality and fitness for work.
- (7) Materials, if rejected by the EIC, shall be immediately removed from the site of work. If they are not removed within twenty four hours of receiving such an intimation, EIC shall get the same remove at contractor's cost. The EIC shall dispose-off such materials in a manner as he choose and the contractor shall not be entitled to any compensation for the cost of such materials.
- (8) Approval to the samples of various materials given by the EIC will not absolve the contractor from the responsibility of replacing the defective materials brought on site or materials used in the work round defective at a later date. The contractor shall have no claim to any payment or compensation whatsoever on account of any such materials being rejected by the EIC.

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- (9) The contractor shall be responsible for observing the laws, rules & regulations imposed under the “Minor Mineral Acts” such other laws and rules prescribed by Government from time to time.

#### **M -1 Water :**

Water to be used for mixing & curing or for any use in work shall be clean ,clear and free from injurious amounts of oils, acids, alkalis, salts, sugar, organic material and other substances that may be deleterious and cause of either weakening the mortar or concrete or cause efflorescence or attack the steel in RCC. Water shall also not be salty or brackish. Container for transport, storage & handling of water shall be clean.

If required by the EIC, it shall be tested by comparison with distilled water. Comparison shall be made with standard cement tests as soundness, curing time and mortar strength as specified in IS – 269-1976, any indication of unsoundness, change in time of setting by 30 minutes or more or decreases of more than 10 percent in strength of mortar prepared with water sample when compared with the results obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test. Water fit for drinking will generally be found suitable for mortar or concrete. Water for curing to mortar concrete or masonry should not be too acidic or too alkaline. It shall be free of elements which significantly affect the hydration reaction or otherwise interfere with the hardening of mortar of concrete during or those produce objectionable stains or other unsightly deposits on concrete or mortar surfaces.

Hard and bitter water shall not be used for curing. Potable water will generally be found suitable for curing of mortar of concrete. As a guide the following concentrations represent the maximum permissible values:

- a) To neutralize 100ml sample of water, using phenolphthalein as indicator, it should not require more than 5ml of 0.02 normal NaOH, when tested as per para 8.1 of IS 3025 ( part 22).
- b) To neutralize 100ml sample of water, using mixed indicator, it it should not require more than 25ml of 0.02 normal H<sub>2</sub>SO<sub>4</sub>, when tested as per para 8 of IS 3025 ( part 23)
- c) Permissible limits for solids shall be as per table – 1 of IS 456 / 2000 or latest revision. Water approved for construction purpose shall be also good for curing purpose. However, water used for curing should not produce any objectionable stains or unsightly deposits on construction surfaces. The presence of Tannic acid & iron compounds is objectionable.

#### **PERMISSIBLE LIMITS FOR SOLIDS IN WATER FOR CONSTRUCTION.**

<b>Sr. No.</b>	<b>Type of Impurity.</b>	<b>Tests as per.</b>	<b>Permissible limits of Impurities.</b>
1.	Organic.	IS 3025:P-18	Max: 200 mg. / lit.
2.	Inorganic.	IS 3025:P-18	Max: 3000 mg. / lit.
3.	Sulphates – SO <sub>3</sub> .	IS 3025:P-24	Max: 400 mg. / lit.
4.	Chlorides -- Cl..	IS 3025:P-32	Max: 2000 mg. / lit. for PCC. Max: 500 mg. / lit. for RCC.
5.	Suspended matter.	IS 3025:P-17	Max: 2000 mg. / lit.

**pH value of water shall not be less than 6.**

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**M -2 Lime :**

Lime shall be hydraulic lime as per I.S. 712-1973. Necessary tests shall be carried out as per IS- 69332 (Part I to X) 1973.

Storage shall comply with I.S. 712-1973. The slacked limes if stored shall be kept in a weather proof and damp- proof shed with impervious floor and sides be protected it against rain, moisture, weather and extraneous materials mixing with it. All limits that have been damaged in any way shall be rejected and all rejected materials shall be removed from site of work.

Field testing shall be done according to I.S. 1624-1974 to show the acceptability of materials.

**M -3 Cement:**

Cement shall be ordinary Portland cement grade 33 as per I.S - 269, grade 43 as per I.S – 8112 and cement of grade 53 as per IS - 12269. Sulphate resisting cement as per IS – 12330 . Cement shall be procured by the contractor from authorized dealer of the manufacture of repute. Contractor shall procure Test certificate from manufacture for the cement company for the batch of cement supplied.

Cement manufactured from Mini Plant shall not be used. The contractor shall take every precaution to store the cement properly so that it is not spoiled by dampness etc. Cement required for use shall be fresh as possible and stored on planks raised 15 to 20 cms. above the floor and stacked 30 cms. away from the wall in suitable closed weather proof godown at the site of work. Cement shall be stored in such a way to allow the removal and use of cement in chronological of receipt i.e. first received being first used. Not more than 15 bags shall be stacked vertically in one pile and maximum width of the piles should not more than 3 meters. Any cement which has deteriorated caked or which has been set or partially set shall not be used. When temporarily stored in open for use, it shall be kept on a suitable platform and suitably protected as necessary. Any cement that is damaged through careless handling, transport and storage shall be contractor's responsibility and be removed all rejected cement from site within 24 hours.

Different brand of cement of cement or cement of the same brand from different factories shall be stored in separate groups and shall not be mixed during use. Cement shall be kept in a store under double locking arrangements. A board indicating stock and daily transactions of cement shall be kept in each room of the cement store. Daily account of receipt & use of cement bags shall be maintained by the contractor in the Performa prescribed by the EIC.

Necessary tests for quality assurance as per quality assurance plan shall have to be carried out by the contractor at his own cost. Cement stored for period longer than three months shall only be permitted by EIC, after necessary tests carried out by contractor at his cost.

The cement shall be measured by one bag for all use in concrete (except other wise stated) & masonry etc. in no case cement shall be measured by boxes or other means for the volumetric pro-portion of contract & mortar. For calculation for the proportion, the volume of the cement bag shall be taken as 0.0342 Cum. (1.20 C. ft.) and measuring box of size of 30 cms x 30 cms x 38 cms for concrete works. If weight concrete is to be used, the cement shall have to be used as per actual weight and the

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contractor shall not be entitled for any compensation for loss in weight due to shifting of bags or on account of any reasons.

**M -4 White cement :**

The white cement shall conform to IS- 8042-E-1076.

**M -5 Coloured cement :**

Coloured cement shall be with white or grey Portland cement as specified in the item of the work.

The pigments used for coloured cement shall be of approved quality and shall not exceed 10% of cement used in the mix. The mixture of pigment and cement shall be properly ground to have a uniform colour and shade. The pigment shall have such properties to provide for durability under exposure to sunlight and weather. The pigments shall have the property such that it is neither affected by the cement nor detriment to it.

**M -6 Sand / Fine Aggregates:**

Fine aggregates shall be Hard, strong, durable, clean and free from veins and adherent coatings. The use of flaky sand elongated pieces of aggregates is not permitted. The aggregates shall not contain deleterious materials such as iron, pyrites, coal, mica, shale or similar laminated materials, clay alkali, soft fragments, sea shells, organic impurities etc. in such quantity as to affect the strength and durability of structure constructed. Harm full materials may also affect embedded reinforcement bars in concrete and adversely affect age of concrete structure. Maximum permissible limits of various deleterious materials permitted are as per table above.

The sand shall be obtain from approved sources by EIC and shall confirm to latest IS No.383.

If the EIC consider it necessary fine aggregates shall be washed and / or screened by the contractor at their own cost.

The sand shall have fineness modules not less than 2.5 and greater 3.00 and shall confirm to following analysis.

IS Sieve No.	Percentage Passing	
	Natural / Crushed gravel	Crushed Stone
4.75 mm	95-100	90-100
2.36 mm	70-95	60-90
1.18 mm	45-85	40-80
600 micron	25-60	20-50
300 micron	5-30	5-30
250 micron	0-10	0-15

The specific gravity of sand shall not be less than 2.6. In no case, fine aggregates shall be accepted containing more than 2% by dry weight, not more than 3 ½ % by dry volume, not more than 5% by wet volume of clay, loam or silt. If any sample or fine aggregate shows, more than 5% of clay, loam, silt in hour's settlement after shaking in an excess of water, the material represented by the samples shall be rejected. The following two field tests are recommended for ascertaining the percentage of clay lumps and impervious organic material, and the contractor shall carry out the same, if the engineer deems fit.

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**M -7 Stone – dust :-**

This shall be obtained from crushing hard black trap-stone. It shall not contain more than 8% of silt determined by field test with measuring cylinder. The method of determining silt contents by field is given as under :

A sample of stone dust to be tested shall be placed without drying in 200 mm measuring cylinder. The quantity of the sample shall be such that it fills the cylinder upto 100 mm mark. The clean water shall be added upto 150 mm mark. The mixture shall be stirred vigorously & the content allowed to settle for 3 hours.

The height of silt visible as settled layer above the stone dust shall be expressed as percentage or the height of the height of the stone dust below. The stone dust containing more than 8% silt shall be washed so as to bring the silt content within the allowable limit. The fineness modulus of stone dust shall not be less than 1.80.

**M -8 Black Trap Grit :-**

Grit shall consist of crushed or broken stone and be hard, strong dense, durable clean of proper gradation and free from skin or coating likely to prevent proper adhesion of Mortar Grit shall generally be cubical in shape and as far as possible flaky elongated pieces shall be avoided. It shall generally comply with the provision of IS – 383-1970. Unless special stone of particular quarries are mentioned, aggregate shall be broken from the best black trap stone as approved by the Engineer-in-charge. Stones shall have no deleterious reaction with cement.

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

I.S. sieve designation	Percentage passing for sieve.
12.50 mm	100%
10.00 mm	45-100%
4.75 mm	0-20%
2.36 mm	0-5%

The crushing strength of grit shall be such as to allow the concrete in which to be used to built up the specified strength of concrete.

The necessary test for grit shall be carried out as per the requirement of I.S.- 2386-Part-I to VIII of 1993 or as revised from time to time as per instruction of the Engineer-in-charge.

**M -9 Cement Mortar.**

**Cement** : Cement shall conform to specification M-3

**Water** : Water shall conform to specification M-1

**Sand** : Sand shall conform to specification M-6.

**Proportion of mix :**

Cement and sand shall be mixed to specified proportion. Sand being measured by measuring boxes. The proportion of cement will be by volume on the basis of 50 kg/bag of cement being equal to 35 liters or 0.0342 M<sup>3</sup>. The mortar may be hand mixed or machine mixed as directed by the Engineer-in-charge.

**Preparation of mortar:**

In hand mixed mortar, cement and sand in the specified proportion shall be thoroughly mixed dry on a clean impervious platform by turning over at least 3 times

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of more till a homogeneous mixture of uniform colour is obtained. Mixing platform shall be so arranged that no deleterious, extraneous material shall be get mixed with mortar or mortar shall flow out, while mixing the water shall be gradually added and thoroughly mixed to form a stiff plastic mass of uniform colour so that each particle of sand shall be completely covered with a film of wet cement. The water cement ratio may be adopted as directed by the Engineer-in-charge.

The mortar so prepared shall be used within 30 minutes of adding water; only such quality of mortar shall be prepared as can be used within 30 minutes. The mortar remaining unused after that period or mortar which has partially hardened or damaged shall not be re-tempered or remixed. It shall be destroyed or thrown away.

**M -10 Black trap stone coarse aggregate for plain and ordinary reinforced concrete.**

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

**TABLE -1**

<b>L.S. sieve designation.</b>	<b>Percentage aggregates 40 mm</b>	<b>Passing for single of nominal size 20 mm</b>	<b>Size 16mm</b>
40mm	85-100	100	100
20mm	0-20	85-100	100
16mm	--	--	--
12.5 mm	--	--	--
10 mm	0-5	0-20	0-30
4.75mm	--	0-5	0-5
2.36 mm	--	--	--

Note:

This percentage may be varied some what by the Engineer-in-charge when considered necessary for obtaining better density and strength of concrete.

Single size coarse aggregates conforming to the requirements in Table No. 1 above or following nominal size shall be used at site with the other ingredients of concrete as indicated below. The mixing shall be in a mixture or on the platform as directed in case of CC 1:5:10 only. For CC 1:4:8, CC 1:3:6, CC 1:2:4 and CC 1:1<sup>1/2</sup>:3 mixing with the other ingredient of concrete shall be done in the mixture only except for small works.

- (1) CC 1:5:10 - Nominal size of aggregate 40 mm
- (2) CC 1:3:6 - Nominal size of aggregate 20 / 40 mm
- (3) CC 1:4:8 - Nominal size of aggregate 40 mm

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- (4) CC 1:2:4 - Nominal size of aggregate 20 mm
- (5) CC 1:1<sup>1/2</sup>:3- Nominal size of aggregate 20 mm

The grading test shall be taken in the beginning and at the change at the source of materials. The necessary test indicated in IS 383-1970 and 456-1978 shall have to be carried out to ensure the acceptability. The aggregates shall be stored separately and handled in such a manner to prevent the inter mixing of different aggregates. If the aggregates are covered with the dust, it shall be washed with water to make it clean. The coarse aggregates for plain and reinforced concrete shall be measured by volume in the steel or wooden boxes prepared as per the direction of the Engineer-in-charge.

**M -11 Black trap stone coarse aggregates for controlled reinforced concrete:**

Coarse aggregate shall be of machine crushed stone of black trap and be hard, strong, dense, durable, clean and free from skin and coating likely to prevent proper adhesion mortar.

The aggregates shall generally be cubical in shape. Unless special stones of particular quarries are mentioned, aggregate shall be machine crushed from the best, black trap stone as approved by the Engineer-in-charge. Aggregate shall have no deleterious reaction with cement.

In proportion concrete, the quantity of coarse aggregate shall be determined by weight only. The grading of coarse aggregate shall be controlled by obtaining the aggregate in different size and blending them in the right proportions as per concrete mix design approved by the Engineer-in-charge. The different sizes shall be stocked in separate stock piles. The grading of aggregates shall be checked as frequently as possible. The frequency for verification of the grading shall be as directed by the Engineer-in-charge to ensure that the grading as maintained uniform with that of the samples used in the preliminary tests.

The necessary test indicated in I.S. 383-1976 and I.S. 456-1978 shall have to be carried out to ensure the acceptability of the material.

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

**M -12 Brick Bats Aggregate :**

Brick aggregates shall be broken from well burnt to slightly over burnt and dense bricks. It shall be homogeneous in texture, roughly cubical in shape, clean and free from dirt of any other foreign material. The brick bats shall be of 40mm to 50mm unless otherwise specified in the item. The under burnt to over burnt brick bats shall not be allowed.

**M -13 Bricks / flyash building brick :**

**(A) First class Bricks :**

The bricks shall be hand or machine moulded and made from suitable soils and kiln burnt. They shall be free from cracks and flaws modules of free time. They shall have smooth rectangular faces with sharp corners and shall be of uniform colour. The bricks shall be moulded with a frog of 100mm x 40 mm and 10mm to 20 mm deep on one of the flat sides. The bricks shall not break when thrown on the ground from a height of 600 mm.

The size of modular bricks shall be 190mmx90mm x 90mm and shall conform to IS 1077-1976 in respect of tolerance for sub-class "A" bricks.

The crushing strength of the bricks shall not be less than 35 kg / sq.cm. The average

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water absorption shall not be more than 20 percent by weight. Necessary tests for crushing strength and water absorption shall be carried out as directed by the Engineer-in-charge.

**(B) Second class bricks:**

The second class bricks shall be similar to first class bricks except that they may be permitted to have slight distorted and rounded edges provided no difficulty shall arise on this account in laying of uniform courses.

**M -14 Mild Steel Bars :**

Mild steel bars reinforcement for RCC work shall conform to I.S. 432 1966 and of tested quality. It shall also comply with relevant part of IS 456-1978.

All reinforcement shall be cleaned and free from dirt, oil, paint, grease, mill's make or loose or thick rust at the time of placing.

Reinforcement steel shall be stored such as to avoid distortion and sags of long length and shall be protected as far as possible from surface deterioration. All bars of the same designation shall be stacked separately as far as possible and distinctly marked. For the purpose of payment the bar shall be measured correct up to 10mm length and weight payable worked out at the rate specified below.

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

**M -15 High Yield Strength Steel Deformed Bars/TMT/CRS :**

High yield strength steel deformed bars shall be either cold twisted or hot rolled and shall conform to IS 1786-1979 & I.S. 1139-1966 respectively or as revised from time to time.

T.M.T. shall conform to IS 1789-FE 500 or as revised from time to time. Approved make for TMT bar shall be Tata, Shah Alloys, Malhotra, Rajury, Sirhind, Thermax etc.

Corrosion Resistance Steel shall conform to relevant IS code or as revised from time to time.

Other provisions and requirements shall conform to specification No. M -14 for Mild steel bars.

**M -16 Mild Steel Binding Wire :**

The mild steel wire shall be of 1.63mm or 1.22mm (16 or 18 gauge) diameter and shall conform to IS 280-1978 or as revised from time to time.

The use of black wire will be permitted for binding reinforcement bars. It shall be free from dust, oil paint, grease, loose mill scale or any other undesirable coating which

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may prevent adhesion of cement mortar.

**Storage:** The wire coils shall be stored such as to avoid deterioration.

**Measurement:** No measurement will be taken of the wire used for tying reinforcement bars. The rate for reinforcement steel and its fabrication shall include the cost of binding wire.

**M -17 Structural Steel :**

All structural steel shall conform to I.S.226-1975 & I.S. 800-1962 or as revised from time to time. The steel shall be free from defects mentioned in I.S. 226-1975 and shall have smooth finish. The material shall be free from loose mill scale, rust pits or other defects affecting the strength and durability Rivet bars shall conform to I.S. 1148-1973.

Structural steel shall be stored such as to avoid distortion of section of long length and shall be protected as far as practicable from surface deterioration. It should be so stored and handled that material will not be subject to excessive stress and damages. All deformed structural material will be properly straightened by methods which are not injurious prior or being aid off, punched or otherwise worked in the shop. Sharp kinks and bends shall be caused for rejection.

When the steel is supplied by the contractor test certificate of the manufacturers shall be produced, if so required by the Engineer-in- charge. If further test be necessary, they will be done according to I.S. 226-1975 & I.S. 223-1950 or as revised from time to time.

**M -18 Shuttering :**

The shuttering shall be either of wooden planking of 30mm minimum thickness with or without steel sheet lining or of steel plates stiffened by steel angles. The shuttering shall be supported on battens and beams and props of vertical bellies properly cross braced together so as to make the form work rigid.

The form work shall be sufficiently strong and shall have camber, so that it assumes correct shape after deposition of the concrete and shall be able to resist forces caused by vibration of live load of men working over it and other incidental loads associated with it. The shuttering shall have smooth and even surface and its joints shall not permit leakage of cement grout.

If at any stage of work during or after placing concrete in the structure, the forms work sags or budges out beyond the required shape of the structure, the concrete shall be removed and work redone with fresh concrete and adequate rigid form work. The complete form shall be got inspected by and approved from the Engineer-in-charge before the reinforcement bars are placed in position.

If wooden props are used, the props shall consist of bellies having 100mm minimum diameter measured at mid length and 80mm at thin end and shall be placed at 1 to 1.20 m. spacing. These shall rest squarely on wooden sole plates 10 mm thick and minimum bearing area of 0.10 sq.m. laid on sufficiently hard base.

Double wedges shall further be provided between the sole plate and the wooden props so as to facilitate tightening and casing of shuttering without jarring the concrete.

The timber used in shuttering shall not be so dry as to absorb water from concrete

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and swell budge nor so green or wet as to shrink after erection. The limber shall be properly swan and planned on the sides and the surface coming in contact with concrete. Wooden formwork with metal sheet lining or steel plates stiffened by steel shall be permitted.

As far as practicable clamp shall be used to hold the forms together and use of nails and spikes avoided.

The surface of timber shuttering that would come in contact with concrete shall be well wetted and coated with soap solution before the concreting is done. Alternatively coat of soap solution or raw linseed oil of approved manufacturer may be applied in place of soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface.

The shuttering for beams and slabs shall have camber of 4 mm per meter (1 in 250) or as directed by the Engineer-in-charge so as to offset the subsequent deflection. For cantilever the camber at free end shall be 1/50 of the projected length or as directed by the Engineer-in-charge.

The period that shall elapse after concrete has been laid before easing and removal of centering and shuttering as under taken shall be as follows :

	<b>Part of structure</b>	<b>Period</b>
1	Sides of foundation, columns beams & walls.	34 to 48 hours
2	Undersides of slabs up to 4.5 m span	7 days.
3	-do- above 4.5 m add under side of beams and arches up to 6 m span.	14 days.
4	-do- above 6 m. span and up to 9 m span.	21 days
5	Undersides of beams and arches over 9 m span	28 days
6	Domes: Shall & other structure of special nature.	As per instruction.

Work damaged through premature or careless removal of forms shall be reconstructed. The period for striking the formwork shall be 1.5 times more in case of Pozzolona cement if used then that of the ordinary Port land cement and the contractor shall not entitle for any extra claim for the same.

#### **M -19 Expansion Joints, Pre-moulded Filler :**

The item provides for expansion joints in R.C.C. frame structure for internal joints, as well as for exposed joints with the use of pre-moulded bituminous joint filler.

Pre-moulded bituminous joint filler i.e. pre-formed strip of expansion joints filler shall not be deformed or broken by twisting bending or other handling when exposed to atmospheric condition. Pieces of joint filler that have been damaged shall be rejected.

Thickness of the pre-moulded joint filler shall be 25mm unless otherwise specified pre-moulded bituminous joints filler shall conform to I.S. 1938-1961 or as revised from time to time.

#### **M -20 Expansion Joints – Copper Strip & Holdfast :**

The item provides for expansion joints in R.C.C. frame structure for internal joints as well as for exposed joints with the use of necessary copper strip and hold fasts. Copper sheet shall be of 125 mm thick and 125mm or required width with the “U” shape in the middle. Copper strip shall hold fast of 3mm diameter copper rod fixed to the plaster shoulders on strip at intervals of about 30 or as shown in the drawing or as directed by the Engineer-in-charge. The width of each flange (horizontal side) of the copper plate to be embedded in the concrete work shall be 25mm depth of “U” to

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be provided in the expansion joint in the copper plate shall be of 25mm.

**M-21 80 mm thick pre-cast Rubber moulded interlock paver concrete block :**

The 80mm thick pre-cast Rubber moulded interlock paver concrete block shall be manufactured by electrical hydraulic operated block marking machine. The block should have minimum compression strength of 300 kg. Per sq.cm. The minimum thickness of the pre-cast Rubber moulded interlock paver concrete block shall be 80mm and minimum size shall be 300x300mm. The block shall be of approved make & best quality as approved by the Engineer-in-charge. The size, shape, and shade of pre-cast Rubber moulded interlock paver concrete block shall be as approved by the Engineer-in-charge. There shall be true to shape. There shall be free from crack, crazing, and spots etc.

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## CODE OF PRACTICE

### GENERAL

- (1) The method of execution of the items shall conform to the relevant specifications as per the latest version of the Indian Standard unless specified otherwise and as far as applicable.
- (2) Wherever a reference to ANY Indian Standard appears in the specification, it shall be taken to mean as a reference to the latest version of the standard.
- (3) The following specifications, standards, and codes are made as a part of this specification.  
**Indian Standards :** specification for building materials, specification for equipment, method of test, method of measurement of building works ,code of practice for construction , safety code for demolition of building, safety code for scaffolds etc. published by the Bureau of Indian Standards
- (4) The contractor shall invariably carry out Materials & work Tests as specified in the tender document **(B-2 Form)** and IS code. However, if the additional tests are required as per the opinion of the Engineer-in-charge, the same shall also have to be carried out. All such tests shall be got carried out in Government or as approved laboratories and cost thereof shall be entirely borne by the contractor. No collection of materials shall be made before it is got approved from the Engineer-in-charge.
- (5) All moulds, equipments etc. required of preparing specimens for the test shall be kept in sufficient numbers and in good state, as directed by the Engineer-in-charge on the site of work.
- (6) Specimen for tests shall sent to the laboratory along with representative of GIDC in time and the results thereof shall be promptly obtained and reported to the Engineer-in-charge.
- (7) Satisfactory test results shall not observed the contractor from dismantling and re-doing any work revealed to the defective at a later date. The contractor shall have no claim for any payment or compensation whatsoever on account of replacement of such defective work. Contractor shall take all precautions and care during dismantling and re-doing the work to ensure that any other work so far executed does not get damage or affected.
- (8) The work shall be carried out in true line and level and in conformity with the detailed drawing and specified patterns.
- (9) All the work shall be carried out in a workmanship like manner and as per the best techniques for the particular item.
- (10) All tools, tempts equipments etc. for correct execution of the work as well as for checking lines, levels, alignments of the works, during execution shall be kept in sufficient numbers on the side of work.
- (11) All installations pertaining to water supply and its fixtures as well as drainage lines and sanitary fitting shall be deemed to be completed only after giving satisfactory tests by the contractor.
- (12) Scaffolding being provided by the contractor at his own cost for such of the items for

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the execution of which it is essential.

## **C-1 Excavation**

### **General:**

In all sorts of soil, sand, gravel, soft murrum and other similar soft or loose material. The excavation will generally refer to the open excavation for foundation.

### **Clearing the site:**

The site on which the structure is to be built shall be cleared and all obstructions, loose stones, material, and rubbish of all kind, bush, wood, and trees shall be removed as directed. The materials so obtained shall be the property of the GIDC and shall be conveyed the stacked as directed by the Engineer-in-charge.

### **Setting out:**

After clearing the site the centre lines will be given by the Engineer. The contractor shall assume full responsibility for alignment, elevation, and dimension of each and all parts of the work. Contractors shall supply labour materials, etc. required for setting out the reference marks and bench marks and shall maintain them as long as required.

### **Excavation:**

It shall be all sorts of soil, sand, gravel, soft murrum, or other similar soft or loose materials.

The excavating for foundation and for basement shall be carried out in true line and level and shall have the width and depth as shown in the drawing or as directed by the Engineer-in-charge. The contractor shall do the necessary shorting and shutting or slopes to a safe angel, if necessary including bailing and pumping out water when separate provision does not exist for it in tender, at his own cost. The bottom of the excavated area shall be leveled both longitudinally and transversely as directed by the Engineer-in-charge. No earth filling will be allowed to bring it to level if by mistake or any other reasons excavation is made deeper or wider than shown on the plan or directed by the Engineer-in- charge. The extra depth or width shall be made up with concrete or masonry of the foundation grade as directed by the Engineer-in- charge and at the cost of the contractor.

### **Disposal of the excavated stuff:**

The excavated stuff of the selected type shall be used in filling the trenches in layers including ramming and watering etc.

The balance of the excavated quantity shall be removed by the contractor from site of work to a place as directed by the Engineer-in-charge with all lead and lift but within the same estate.

#### **a. Excavation in Hard murrum :**

Same as C-1/1 except that the excavation shall be in hard murrum.

#### **b. Excavation in Hard murrum and boulders.**

Same as C-1/1 except that the excavation shall be in hard murrum and boulders.

#### **c. Excavation in soft rock :**

Same as C-1/1 except that the excavation shall be in soft rock.

#### **d. Excavation in Hard rock.**

Same as C-1/1 except that the excavation shall be in hard rock

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**C-2 Plain Cement Concrete Laying in Foundation / for Floor Bedding :****General:**

Before starting concrete, the bed of the foundation trenches shall be cleared of all loose materials and watered as directed.

**Proportioning of Mix:**

The proportion of the cement to sand and coarse aggregates shall be as specified in the item and shall be measured by volume.

**Mixing:**

The concrete shall be mixed in a mechanical mixer at the site of work. Hand mixing may however be allowed for smaller quantities of work if approved by the Engineer-in-charge. The mixing shall be done for a period of 1 1/2 to 2 minutes. The quantity of water shall be just sufficient to produce a dense concrete of required workability for the purpose.

**Scaffolding:**

All scaffolding, hoisting arrangement and ladders etc. required for the facility of concrete shall be provided by the contractor and removed on completion of work. The scaffolding, hoisting arrangement and ladders shall allow easy approach to the work and afford easy inspection.

**Form work:**

The form work shall be provided if necessary as directed by the Engineer-in-charge and shall be as per I.S. 461-1972 or revised from time to time.

**Transporting & placing the concrete:**

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

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

**Compaction:**

The concrete shall be thoroughly compacted by hammers immediately after depositing to get a dense concrete. Concrete shall not be disturbed once it has set.

**Curing:**

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

**C-3 Lime Cinder Concrete Laying :**

This shall be as per C-2 of code of practice. The coarse aggregate in this case shall cylinder.

**C-4 Ordinary Cement Concrete Plain or Reinforce :**

I.S. 466-1978 or as revised from time to time shall be followed in general cement sand by black trap grit and coarse aggregate shall be measured by volume. For proportioning of cement by volume one bag of cement shall be taken as 0.0342 cu.m. (1.2 cft)

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**Mixing:**

Concrete shall be mixed in a mechanical mixer. Mixing shall be continued until there is a uniform distribution of the materials and the mass is uniform in colour and consistency but in no case shall mixing be done for less and 1.1/2 minutes. When hand mixing is permitted by the Engineer-in-charge in case of small work or in case of break down of machineries and in the interest of the work it shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. However, in such cases 10% more cement than otherwise required have to be used without any extra cost.

**Transporting:**

Concrete shall be handled from the place of mixing of the final position as quickly as practicable by methods which will prevent segregation or loss of ingredients. In no case operation shall be taken more than 15 minutes.

**Placing:**

The concrete shall be placed into its final position and completed and finished within 30 minutes of mixing the water and before setting commence. Method of placing shall be such as to avoid segregation, approved by the Engineer-in-charge. Concreting shall be carried out continuously up to construction joints, the position and arrangement of which, shall be pre-determined by the designer.

When the work has to be resumed on a surface which has hardened, such surface shall be roughened. It shall then be swept clean thoroughly wetted and covered with a thin layer or mortar composed of cement and sand in the same proportion as the cement and sand in the concrete mix. This layer of mortar shall be freshly mixed and placed immediately before the placing of the concrete.

When the concrete has not fully hardened, all laitance shall be removed by scrapping the wet surface with wire or bristles care being taken to avoid dislodgement of particles or aggregates. The surface shall be thoroughly wetted and all free water removed. The surface shall be coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150mm in thickness and shall be well rammed against old work. Particular attention is paid no corners and spots.

**Compaction:**

Concrete shall be thoroughly compacted during the operation of placing and thoroughly worked around the reinforcement, around embedded fixtures and into corners of the form work. Compacting shall be done by mechanical vibrations, in such a way that a dense mix is obtained.

**Curing:**

The concrete shall be kept covered with a layer of sacking canvas or similar materials or by pounding and kept constantly wet for twenty one days from the date of placing concrete. Curing by pounding shall preferably be done by erecting suitable dykes of lean mortar.

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**Form work:****General:**

The form work shall conform to the shape, lines and dimensions as on the plans and be so constructed as to remain sufficiently rigid during the placing and compacting of the concrete, and shall be sufficiently water tight to prevent loss of liquid from concrete. Adequate arrangements shall be made by the contractor to safeguard against any settlement of the form work during the course of concreting and after concreting. The design of the form work and centering shall be got approved form Engineer-in-charge before erection.

**Cleaning & Treatment of Forms:**

All rubbish, particularly chipping shavings and saw dust shall be removed from the interior of the forms before the concrete is placed and the form work in contact with concrete shall be cleaned and thoroughly wetted or treatment with an approved composition. Care shall be taken that such approved composition is kept out of contact with reinforcement.

**Stripping Time:**

In normal circumstances and where ordinary cement is used, forms may be struck after expiry of following period

(a)	Walls columns & vertical side of beams	24 to 48 hours as may be decided by the Engineer-in-charge.
(b)	Side of slabs	3 days
(c)	Beam	7 days
(d)	Removal of props to slabs. (i) Slabs spanning up to 4.5 M (ii) Spanning over 4.5 M	7 days. 14 days.
(e)	Removal of props to beams & arches. i) Spanning up to 6 M ii) Spanning over 5 M	14 days 21 days

**Procedure when removing the Form work:**

All form shall be removed without such shock or vibrations as would damage the reinforced concrete surface. Before the soffits and struts are removed and concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened. The form work will be paid under the respective item if provided in the tender.

**Centering:**

The centering to be provided shall be got approved form the Engineer-in-charge. It shall be sufficiently strong to ensure absolute safety of the form work and concrete work before, during, and after pouring concrete. Watch should be kept to see that behavior of centering and formwork is satisfactory during concreting. Erection should also be such that it would allow removal of forms in proper sequence without damaging either the concrete or the forms to be removed.

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The props of centering shall be provided on firm foundation of base of sufficient strength to carry the loads without settlement.

The centering and form work will be inspected and approved by the Engineer-in-charge before concreting. But this will not relieve the contractor or his responsibility for strength, adequacy, and safety of form work and if there is a failure of form work or centering, contractor shall be responsible for the damages to work, injury to life and damage to the property.

#### **Scaffolding:**

All scaffolding, hoisting arrangements etc. required for the facility of concreting shall be provided and removed on completion of work by the contractor at his own expenses. The scaffolding, hoisting arrangement and ladders etc. shall be strong enough to withstand all live, dead and impact loads expected to act and shall be subject to the approval of the Engineer-in-charge. However, contractor shall be solely responsible for the safety of the scaffolding, hoisting arrangement, ladders, work, and workmanship etc.

The scaffolding, hoisting arrangement and ladders shall allow easy approach to the work spot and afford easy inspection.

#### **Testing:**

Work sample of concrete 150mmx150mm x 150mm shall be taken as under:

<b>Qty. of work in M3</b>	<b>No. of sample</b>
1-5	1
6-15	2
16-30	3
31-50	4
51 & above	4+1 for each additional quantity of 50 M or part thereof.

The contractor shall make his own arrangement for taking sample and testing of the sample in the Government or the approved laboratories. The test shall be carried out in accordance with IS 516-1959 or as revised from time to time. A register of cubes shall be maintained the site of work in the prescribed Performa. The result of the cubes shall be submitted to the Engineer-in-charge by the contractor.

Note: (1) At least one sample shall be taken from each shift

(2) Each sample consists of three test specimens for testing at 28 days.

Additional cubes may be required for various purposes. Such as to determine the strength of concrete at 7 days or at the time of striking the form work or to determine the duration of curing or to check the testing error.

Finishing unless otherwise specified in the item to keep the exposed concrete surface, the concrete surface shall be finished with cement mortar 1:4 (1- cement: 4-sand) in true line level in accordance with M-9 of specification of materials.

#### **C-5 Controlled concrete :**

##### **Grade:**

The concrete shall be designed as M-150, M-200, M-250, M -300 & M-400 as prescribed in I.S. 456-1978 or as revised from time to time.

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### Aggregates:

Samples of the aggregates proposed to be used shall be got approved from the Engineer-in-charge prior to collection of the materials at the site of work field test for determining the content of silt, loam, clay etc. In fine aggregate and grading and moisture content in both fine and coarse aggregate shall be carried out before commencing the concreting work and record of the test shall be maintained till the completion of the work.

The grading of aggregate shall be controlled by obtaining the fine and coarse aggregate in different size being stocked in separate stock piles. The grading of coarse and fine aggregate shall be checked as frequently as possible. The frequency shall be as directed by the Engineer-in-charge, to ensure that the uniform grading as per approved samples used in the preliminary tests is maintained.

As soon as possible, after receiving the order to commence the work the contractor shall design the mix for different grades of concrete required in the work submit details in respect of proportion of cement and aggregates water cement ration etc. and arrangement to make trial mixes for preliminary tests to be carried out in the Government or any other approved laboratory to satisfy the Engineer-in-charge that the designed mix meets with the prescribed strength. The maximum total quantity to aggregates by weight per 50 Kg. of cement shall not exceed 450 Kg. except where otherwise specifically permitted by the Engineer-in-charge.

The minimum number of specimens for preliminary test and criteria for acceptance of test strength shall conform to Table –V **Acceptance criteria for concrete of I.S. 456-1978.**

On the satisfactory results of the above tests, the mix actually to be used shall be got approved from Engineer-in-charge. The approval of the Engineer-in-charge will not relieve the contractor of his responsibility for obtaining the required minimum strength in the work test. Record of all tests in support of mix design shall be maintained as a part of record of the contract.

### STRENGTH REQUIREMENT OF CONCRETE:

The compressive strength requirements for various grades of concrete shall not be lower than the figures given below:

Grade of concrete	Compressive strength of 15 cms cubes conducted in accordance with I.S. 516-1959.		
	After 28 days after mixing in preliminary test (Kg/cm <sup>2</sup> )	At 7 days after mixing in work test	At 28 days after mixing in work test (Kg/cm <sup>2</sup> )
M-100	135	70	100
M-150	200	100	150
M-200	260	135	200
M-250	320	170	250
M-300	380	200	300
M-350	440	235	350
M-400	500	270	400

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**PROPORTIONING & WORKS CONTROL:**

The mix proportions shall be selected to ensure that the workability of the fresh concrete suitable for the condition of handling and placing, so that after compaction it surrounds all reinforcement and completely fills the form work. When concrete is hardened, it shall have the required strength, durability and surface finish.

The determination of the proportions of cement, aggregate and water to attain the required strength shall as follows:

- (a) By designing the concrete mix; such concrete shall be called "Design Mix Concrete" or "Controlled Concrete".
- (b) By adopting nominal mix, such concrete shall be called "Nominal Mix Concrete".

**TABLE - 2.8**

**OPTIONAL WORK TEST REQUIREMENTS OF CONCRETE (All values in N/mm<sup>2</sup>)**  
**(All tests conducted in accordance with IS: 516)**

Grade of Concrete	Compressive Strength of 150mm cubes, min at 7 days	Modulus of Rupture by Beams Test Min.	
		At 72 + 2 hrs.	at 7 days
M - 10	7	1.2	1.7
M - 15	10	1.5	2.1
M - 20	13.5	1.7	2.4
M - 25	17	1.9	2.7
M - 30	20	2.1	3.0
M - 35	23.5	2.3	3.2
M - 40	27	2.5	3.4

The concrete mix shall be designed to have an average strength corresponding to the values specified for preliminary tests in Table. The proportions chosen should be such that the concrete is of adequate workability for the conditions prevailing on the work in question, and can be properly compacted with the means available. The maximum total quantity of aggregate by weight per 50 kg. Of cement shall not exceed 450 kg. except where otherwise specially permitted by the Engineer-in-Charge.

Except where it can be shown to the satisfaction of the Engineer-in-Charge that supply of properly graded aggregate of uniform quality can be maintained over the period of work, the grading of aggregate should be controlled by obtaining the coarse aggregate in different sizes and blending them in the right portions when required, the different sizes being stocked in separate stock piles. The material should be stock piled for several hours preferably a day before use. The grading of coarse and fine aggregate should be checked as frequently as possible, the frequency for a given job being determined by the Engineer-in-Charge to ensure that the suppliers are maintaining the grading uniform with that of the samples used in the preliminary test.

In proportioning concrete, the quantity of both cement and aggregate should be determined by weight, where the weight of cement is determined by accepting the maker's weight per bag. A reasonable number of bags should be weighted separately to check the net weight. Where the cement is weighed on the site and not in bags, it should be either measured by volume in calibrated tanks or weighed. All measuring

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equipment should be maintained in clean serviceable conditions, and their accuracy periodically checked.

It is most important to maintain the water cement ratio constant at its correct value. To this end, determination of moisture contents in both fine and coarse aggregates should be made as frequently as possible, the frequency for a given job being determined by the Engineer-in-Charge according to weather conditions. The amount of the added water shall be justified to compensate for any observed variations in the moisture contents. For the determination of moisture content in the aggregate for concrete: Part-III specific gravity, density, voids, absorption and bulking may be referred to. To allow for the variation in weight of aggregate due to variation in their moisture content, suitable adjustments in the weights of aggregate should also be made.

No substitutions in materials used on the work or alterations in the established proportions, except as permitted in the above para shall be made without additional tests to show that the quality and strength of concrete are satisfactory.

#### **WORKABILITY OF CONCRETE:**

The concrete mix proportions chosen should be such that concrete is of adequate workability for the placing conditions of the concrete and can properly be compacted with the means available. The definitions of the ranges of "workability" of concrete as measured by either the slump or V-B tests (IS: 1199) and the range to be adopted for different kinds of work unless specified otherwise is given in Table - 2.9.

**TABLE - 2.9**

#### **WORKABILITY OF CONCRETE**

Placing conditions	Degree of Workability	Slump (mm)	Values of Workability	
			Vee-Bee	Compacting Factor
Blinding concrete; Shallow Sections; Pavements using pavers	Very Low	--	20- 10 secs	0.75 - 0.80
Mass concrete; Lightly reinforced sections in slabs, beams, walls, columns; Floors; Hand placed pavements; Canal lining; Strip footings	Low	25 - 75	10 - 5 secs	0.80 - 0.85
Heavily reinforced sections in slabs, beams walls, columns; Slip form work; Pumped concrete	Medium	50 - 100 75 - 100	5 - 2 secs	0.85 - 0.92*
Trench fill; In-situ piling Termite concrete	High Very high	100 - 150 Workability to be decided by determination of flow (IS: 9103)	--	Above 0.92** Above 0.92**

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**Note:** For most of the placing conditions, internal vibrators (needle vibrators) are suitable. The diameter of the needle shall be determined based on the density and spacing of reinforcement bars and thickness of sections. For tremie concrete, vibrators are not required to be used.

A competent person should be employed whose duty will be to supervise all stages in the preparation and placing of the concrete. All works test specimens should be prepared and site tests carried out under his direct supervision

#### **REQUIREMENT FOR DURABILITY:**

Minimum cement content required in cement concrete to ensure durability under specified conditions of exposure should be as given in Table 2.12 unless otherwise specified. The general environment to which the concrete will be exposed during its working life is classified into five levels of severity, that is, mild, moderate, severe, very severe and extreme as described in Table 2.13.

**TABLE - 2.12**

**Minimum Cement Content, Maximum Water Cement Ratio and Minimum Grade of Concrete for Different Exposures with Normal Weight Aggregates of 20mm Nominal Maximum Size**

Sr. No.	Exposure	Plain Concrete			Reinforced Concrete		
		Minimum Cement Content kg/m <sup>3</sup>	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content kg/m <sup>3</sup>	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete
1.	Mild	220	0.60	--	300	0.55	M-20
2.	Moderate	240	0.60	M-15	300	0.50	M-25
3.	Severe	250	0.50	M-20	320	0.45	M-30
4.	Very Severe	260	0.45	M-20	340	0.45	M-35
5.	Extreme	280	0.40	M-25	360	0.40	M-40

The general environment to which the concrete will be exposed during its working life is classified into five levels of severity, that is, mild moderate, severe, very severe and extreme as described in Table 2.13.

**TABLE 2.13**

#### **ENVIRONMENTAL EXPOSURE CONDITIONS**

Environment	Exposure Conditions
Mild	Concrete surfaces protected against weather or aggressive conditions, except those situated in coastal area.
Moderate	Concrete surfaces sheltered from severe rain or freezing whilst wet. Concrete exposed to condensation and rain Concrete continuously under water Concrete in contact or buried under non-aggressive soil/ground water Concrete surfaces sheltered from saturated salt air in coastal area
Severe	Concrete surfaces exposed to severe rain, alternate wetting and drying or occasional freezing whilst wet or severe condensation. Concrete completely immersed in seawater

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		Concrete exposed to coastal environment
	Very Severe	Concrete surfaces exposed to seawater spray, corrosive fumes or severe freezing conditions whilst wet. Concrete in contact with or buried under aggressive sub-soil/ground water
	Extreme	Surface of members in tidal zone Members in direct contact with liquid/solid aggressive chemicals

### **MIX DESIGN AND SAMPLING AND TESTING FOR CONCRETE**

Facilities required for sampling materials, shall be provided when required by the Engineer. The methods used in sampling, laying curing and testing the concrete samples, either in the field or in the laboratory, shall be in accordance with the appropriate Indian Standards. This is to investigate the grading of aggregate, water cement ratio, workability and the quantity of cement required to give works cubes of the minimum strength specified.

The mix shall be designed to produce the grade of concrete having required workability and desired characteristic strength. As long as the quality of the materials does not change, a mix design done earlier may be considered adequate for later work. As already stated under "proportioning" the proportion of the mix shall be by weight. In case uniformity in the materials used for concrete making has been established over a period of time, the proportioning may be done by volume batching, by the use of bulk densities, provided periodic checks are made on mass/volume relationships of materials. Where weigh batching is not practicable, the quantities of fine and coarse aggregate (not cement) may be determined by volume. If aggregate is moist and volume batching is adopted, allowance shall be made for bulging in accordance with IS: 2386 (Part-III). Mix proportioning shall be carried out according to the ACI Standard ACI 631 or "Design of Concrete Mixes" Road Research Note No.4 of Department of Scientific and Industrial Research, U.K.

Whenever there is either a change in strength of concrete required, water cement ratio, workability or the source of aggregates and cement, preliminary tests shall be conducted again to determine the revised proportions of the mix to suit the later conditions. While designing mix proportions, over wet mixes should always be avoided.

### **PRELIMINARY TESTS:**

The materials and proportion used in main preliminary tests shall be similar in all respects to those to be actually employed in the works as the object of this test is to determine proportion of cement, aggregates and water necessary to produce the concrete of consistency required to give the strength specified. It will be the contractor's sole responsibility to carry out these tests and he shall therefore furnish to the Engineer, statement of proportions proposed to be used for concrete mix. For preliminary tests, the following procedure shall be followed. Materials shall be brought to the room temperature and all materials shall be in a dry condition. The quantities of water, cement and aggregate for each batch shall be determined by weight to an accuracy of 1 Part in 1000.

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**(a) Mixing:**

Concrete shall be mixed in a mechanical mixer. The mixer should comply with IS: 1791. The cement and fine aggregate shall first be mixed dry until the mixture is in uniform colour. The coarse aggregate shall then be added, mixed and water added and mixed thoroughly for a period of not less than two minutes after all the materials are in the drum and until the resulting concrete is uniform in appearance. If there is segregation after unloading from the mixer, the concrete should be remixed.

(b) The consistency of each batch of concrete shall be measured immediately after mixing, by the slump test in accordance with IS: 1999. In the slump test, care shall be taken to ensure that no water is lost; the material used for slump test may be remixed with the remainder of concrete for making the test specimen. The period of remixing shall be as short as possible yet sufficient to produce a homogeneous mass.

Note: In exceptional circumstances such as mechanical breakdown of mixer, work in the remote areas or when the quantity of concrete work is very small, hand mixing may be permitted, subject to adding 10% extra cement at his (contractor's) cost. When hand mixing is permitted, it shall be carried out on a watertight platform and care shall be taken to ensure that mixing is continued until the concrete is uniform in colour and consistency.

**CONCRETE CUBES:****(a) Size of test specimen & moulds:**

Test specimens cubical in shape shall be 150 x 150 x 150 mm. If the largest nominal size of the aggregate does not exceed 200mm, 100 mm cubes may be used as an alternative.

A cube mould should be of metal and stout enough to prevent distortion. It shall be constructed in such a manner as to facilitate the removal of the moulded specimen without damage, and shall be so machined that, when it is assembled ready for use, the dimensions and internal faces shall be accurate within the following limits:

Height of mould and distance between opposite faces: Specified size + 0.2 mm.

Angle between adjacent faces:  $90 \pm 0.5$  degree

Each mould shall have a plane face metal base plate of such size as to support the mould during the filling without leakage and shall be attached to the moulds; when assembled shall be positively and rigidly held together and suitable methods of ensuring this, both during filling and on subsequent handling of the filled mould, shall be provided. In assembling the mould for use, the joints between the sections of mould shall be thinly coated with mould oil and a similar coating of mould oil shall be applied between the contact surfaces of the bottom of the mould and the base plate in order to ensure that no water escapes during filling. The interior surfaces of the assembled mould shall be thinly coated with mould oil to prevent adhesion of the concrete. The tamping bar shall be a steel bar 16 mm. in diameter, 0.6 m. long and bullet pointed at the lower end.

**(b) Compacting:**

The test specimens shall be made as soon as practicable after mixing and in such a way as to produce full compaction of the concrete with neither segregation nor excessive laitance. The concrete shall be filled into the mould in layers approximately 50 mm deep. In placing each scoopful of concrete, the scoop shall be moved around

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the top edge of the mould as the concrete slides from it, in order to ensure a symmetrical distribution of the concrete within the mould. Each layer shall be compacted as described below. After the top layer has been compacted, the surface of the concrete shall be finished level with the top of the mould using a trowel, and covered with a glass or metal plate to prevent evaporation.

For compacting, standard tamping bar shall be used and the strokes of the bar shall be distributed in a uniform manner over the cross section of the mould. The number of strokes per layer required to produce specified conditions will vary according to the type of concrete but in no cases shall be less than 35 strokes per layer for 150 mm cubes or 25 strokes per layer for 100 mm cubes. The strokes shall penetrate into the underlying layer and the bottom layer shall be rodded throughout its depth. Where the tamping bar leaves voids, the sides of the mould shall be tapped to close the voids.

**(c) Curing:**

The test specimen shall be stored on the site at a place free from vibration under damp-matting, sacks or other similar material for 24 hours + 0.5 hour from the time of adding water to the other ingredients at a temperature range of 22° C to 32° C After 24 hours, they shall be marked for later identification, removed from the moulds and stored in clean water at a temperature of 24° C to 30° C. They shall be sent to the testing laboratory well packed in damp sand, sacks or other suitable material so as to arrive there in a damp condition not less than 24 hours before the time of test. On arrival at the testing laboratory, the specimen shall be stored in water at 27° C +2° C temperature until the time of test. Records of the daily maximum and minimum temperature shall be kept both during the period the specimens remain on the site and in the laboratory.

**(d) Tests for Cube Specimen:**

The concrete cubes shall be tested in standard testing machines by skilled personnel. Tests shall be made at recognized ages of the test specimen, the most usual being 7 and 28 days. Tests may be made at 24 hours + 1/2 hour and 72 hours + 2 hours if early strengths are needed. The age shall be calculated from the time of the addition of water to the dry ingredients.

At least three specimens, preferably from different batches shall be made for testing at each selected age.

Specimens stored in water shall be tested immediately on removal from the water and while they are still in the wet condition. Surface water and grit shall be wiped off the specimens and any projecting fins removed.

The bearing surface of the testing machine shall be wiped clean and any loose sand or other material removed from the surfaces of the specimen, which are to be in contact with the compression platens. The specimen shall be so placed in the machine that the load shall be applied to the opposite sides of the cubes as cast, that is, not to the top and bottom. The axis of the specimen shall be carefully aligned with the centre of thrust of the spherically seated platen. No packing plates shall be used between specimen and platens of the machine. Once the uniform seating is obtained, load shall be applied without shock and increased continuously at a rate of approximately 14.0 N/mm<sup>2</sup> /Min. until the resistance of the specimen to the increasing load breaks down and no greater load can be sustained. The maximum load applied to the specimen

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shall be recorded and the appearance of the concrete and any unusual features in the type of failure shall be noted.

The measured compressive strength of the specimen shall be the maximum load applied to the specimen divided by the cross sectional area of the specimen and shall be expressed to the nearest N. per sq. mm. Average of the values shall be taken as the representative of the batch provided the individual variation is not more than + 15 percent of the average. Otherwise repeat tests shall be made. Cube crushing strength shall conform to the values given in Tables 2. 7 and 2.8.

**(e) Frequency of Sampling of Concrete Cubes:**

A random sampling procedure should be adopted to ensure that each concrete batch shall have a reasonable chance of being tested; that is, the sampling should be spread over the entire period of concreting covering all mixing units. The minimum frequency of sampling of concrete of each grade shall be as follows:

<b>Quantity of concrete in the work cu. m.</b>	<b>No.of samples</b>
1 - 5	1
6 - 15	2
16 - 30	3
31 - 50	4
51 and above	5 Plus one additional sample for each additional 50m or part thereof

The test specimens shall be made from each sample for testing at 28 days. Additional cubes may be required for determining strength of concrete at 7 days. The test strength of the sample shall be the average strength of three specimens. The individual variation should not be more than 15 percent of the average.

Concrete shall be assessed daily for compliance. The contractor shall keep a record at site of all such tests identifying them with the proportion of the work to which they relate. The Architects will check this record from time to time. The said record shall give the following details and shall be initiated by the Engineer-in-Charge.

- (i) Reference to specific structural member receiving the batch of concrete from which the cubes were cast.
- (ii) Mark on cubes.
- (iii) Mix of concrete.
- (iv) Data and time of casting.
- (v) Water cement ratio by weight and slump.
- (vi) Crushing strength as obtained at the end of 7 days for 3 cubes out of a set of 6 cubes and the end of 28 days for the remaining 3 cubes.
- (vii) Laboratory in which tested and reference to test certificates.
- (viii) The quantity of concrete, incorporated in work that is represented by the quantity of concrete of the set of the cubes.
- (ix) Any other information required by Architects.

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**(f) Consistency:**

The consistency of each sample of concrete shall be measured immediately after remixing by the slump test. The slump shall be as directed by the Engineer, which would be based on the preliminary test result keeping in view, the workability of the concrete. The approved slump shall be maintained through the field operations unless otherwise directed by the Engineer. In order to ensure the maintenance of uniform consistency, slump tests shall be carried out as often as demanded by the Engineer and invariably with the batch of concrete from which test cubes are made.

**(g) Record of Temperature:**

A record of maximum and minimum temperature at the places of storage of the cube shall be maintained, during the period they remain at site, by the Contractor.

**OPTIONAL TESTS:**

The Engineer, if he so desires, may order tests to be carried out on cement, sand, coarse aggregate in accordance with the Indian Code of Practice or any other approved code.

Tests on cement shall include:

- (i) Fineness Test,
- (ii) Test for Normal Consistency,
- (iii) Test for Setting Time,
- (iv) Test for Soundness,
- (v) Test for Tensile Strength,
- (vi) Test for Heat of Hydration (by experiment and by calculations) in accordance with BIS or any other approved standard for cements.

Test on sand shall include:

- (i) Sieve Test
- (ii) Test for Organic Impurities
- (iii) Decantation Test for Determining Clay
- (iv) Specific Gravity Test
- (v) Test for Sieve Analysis and Fineness Modulus.

Tests on coarse aggregate shall include:

- (i) Sieve Analysis
- (ii) Specific Gravity and Unit Weight of Dry Loose and Rodded Aggregate (Bulk Density Test)
- (iii) Determination of Yield of a Dry Mixture
- (iv) Petrographic Examination of Deleterious Minerals in Aggregates.
- (v) Test for Aggregate Crushing Value and 10% Fine Value Test.
- (vi) Aggregate Impact Value
- (vii) Toughness Test

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- (viii) Soundness Test
- (ix) Hardness Test
- (x) Alkali Aggregate Reaction
- (xi) Deleterious Material

Any or all these test would normally be ordered to be carried out, if the specified concrete strengths are not obtained, at the Contractor's cost. If the works cubes do not give the stipulated results, the Engineer reserves the right to ask the Contractor to dismantle such portions of the work, which in his opinion are unacceptable and re-do the work to the standard stipulated at his (Contractor's) cost. It shall be very clearly understood by the Contractor that no extra claims shall be entertained by the Owner for excess use of cement over the minimum quantity stipulated to give the works cubes of required strength. The unit rate for design and test cubes, works cubes, testing them as per specifications, optional tests etc.

Unless otherwise stipulated, the concreting, testing, etc. shall be carried out as directed by the Engineer and to the appropriate BIS Specifications. In the event of any work being suspected of faulty materials or workmanship or both, the Engineer before requiring its removal and reconstruction, may order, or the contractor may request, that it should be load tested in accordance with the following provisions.

#### **LOAD TEST ON MEMBERS OR ANY OTHER TEST:**

The test load shall be 125 percent of the specified super imposed load for which the structure was designed in addition to the full dead load (self-weight of structure members plus weight of finishes and walls or partitions, if any as considered in the design). Such test load shall not be applied before 28 days after the time of placing of concrete.

During the tests, struts strong enough to take the whole load shall be placed in position leaving a gap under the members. The test load shall be kept for 24 hours before removal.

If within 24 hours of the removal of the load, the structure does not show a recovery of at least 75 percent of the maximum deflection shown during the 24 hours under load, the test loading shall be repeated after a lapse of at least 72 hours. The structure shall be considered to have failed to pass the test if the recovery after the second test is not at least 80 percent of the maximum deflection shown during the second test.

If during the test, or upon removal of the load, the structure shows signs of weakness, undue deflection or faulty construction it shall be reconstructed or strengthened as necessary.

Any other test, e.g. taking out concrete cores, examination and test on such cores removed from such parts of the members in an approved manner and as directed by the Engineer shall be carried out by the Contractor at his own cost, if so directed.

#### **TESTING CONCRETE OF TANKS FOR LEAKAGE:**

In addition to the structural test given in clause above, structures (tanks, chests, pits, etc.) to be used for storage of liquids shall also be tested for water tightness at full storage level as described below:

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(a) In case of structure whose external faces are exposed such as elevated tanks, the requirements of the test shall be deemed to be satisfied if the external faces show no sign of leakage or sweating and remain completely dry over the period of observation of seven days after allowing a seven days period for absorption after filling with water.

(b) In case of structures whose external faces are backfilled and are not accessible for inspection, such as underground tanks, the tanks shall be filled with water and after the expiry of seven days after the filling; the level of the surface of the water shall be recorded. The level of water shall be recorded again at subsequent intervals of 24 hours over a period of 7 days. The total drop in surface level over a period of seven days shall be taken as an indication of the water tightness of the tank. The Engineer shall decide on the actual permissible rate of this drop in the surface level, taking into consideration whether the tanks are open or closed and the corresponding effect it has on evaporation losses. Backfilling shall be withheld till the tanks are tested if directed by the Engineer

**Costs of Tests:**

The entire cost of tests as specified, in clause above shall be borne by the Contractor.

**Unsatisfactory Test:**

If the results of any test prove unsatisfactory, the Contractor shall remove and rebuild the member or members involved or carry out such other remedial measures as may be required by the Engineer or his representative. The Contractor shall bear the cost of so doing, unless the failure of the member or members to fulfil the test condition is solely due to faulty design.

**PLACING:**

The procedure for placing of concrete shall be as follows:

- a. Preparation before placing of concrete shall be as given below.

(i) **Engineer's Approval of Equipment & Method:**

Before any concrete is placed, the entire placing programme, consisting of equipment, layout, proposed procedure and methods shall be submitted to the Engineer for approval if so demanded by the Engineer and no concrete shall be placed until the Engineer's approval has been received.

- (ii) Hardened concrete and foreign materials should be removed from the inner surface of the conveying equipments.
- (iii) Form work shall have been completed; snow, ice and water shall have been removed. Reinforcement shall have been secured in place, expansion joint material, anchors and other embedded items shall have been positioned and the entire preparation shall have been approved.
- (iv) No concrete shall be placed on watered surface.
- (v) Rain or Wash Water:

No concrete shall be placed in wet weather and any concrete that has been washed by heavy rains shall be entirely removed, if there is any sign of cement and sand having been washed away from the concrete mixtures. To guard against damage which may be caused by heavy rains, the works shall be covered with gunny bags immediately

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after the concrete has been placed in position on the surface of the newly placed concrete and shall be removed by approved means and no further concrete shall be placed thereon.

**b. Time interval between mixing and placing:**

Concrete shall be placed in the forms within 30 (thirty) minutes as rapidly as practicable, after addition of water to cement and aggregate, unless otherwise authorised by the Engineer.

**c. Concrete placing by manual labour:**

Except when otherwise approved by the Engineer, concrete shall be placed in the shuttering by shovels or other approved implements and shall not be dropped from a height or handled in a manner, which will cause segregation. Accumulation of set concrete shall be avoided. Concrete shall be placed directly in its permanent position and shall not be worked along the shuttering to that position.

**d. Avoiding segregation:**

Concrete shall, in all cases, be deposited as nearly as practicable directly in its final position, and shall not be caused to flow in a manner, which will cause segregation, loss of materials and impair its strength. For locations where direct placement is not possible, and in narrow forms, the Contractor shall provide suitable drop chutes and "Elephant Trunks" to confine the concrete in movement.

**e. Concrete placing by Mechanical Equipment:**

The following specification shall apply where placing of concrete by use of mechanical equipment is specifically called for while inviting bids or is warranted considering the nature of the work involved.

The control of placing shall begin at the mixer discharge. Concrete shall be discharged by the vertical drop into the middle of the bucket or hopper and this principle of a vertical discharge of concrete shall be adhered to throughout all stages of delivery until the concrete comes to rest in the structures.

**f. Type of Buckets:**

Central bottom dump buckets of a type that provides for positive regulation of the amount and rate of deposit of concrete in all dumping positions shall be employed.

**g. Operation of Bucket:**

In placing concrete in large open areas, the bucket shall be spotted directly over the position designated and then lowered for dumping. The open bucket shall just clear the concrete already in place and the height of drop shall not exceed 1.00 M. The bucket shall be opened slowly to avoid high vertical bounce. Dumping of buckets on the swing, or in any manner which results in segregation of ingredients or disturbances of previously placed concrete will not be permitted.

**h. Placement in Restricted Forms:**

Concrete placed in restricted forms by borrows, buggies, cars, short chutes or hand shovelling shall be subject to the requirement for vertical delivery of limited height to avoid segregation and shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or falling.

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i. **Chuting:**

Where it is necessary to use transfer chutes between mixer, containers or hoppers, and point of deposit in the forms, specific approval of the Engineer must be obtained as regards the type, length, slopes, baffles and vertical terminals. Concrete shall not be permitted to fall from the end of the chutes or tube more than 1.00 M. Chutes, when approved for use shall have slope not flatter than 1to3 and not steeper than 1to2.

j. **Placing by Pumping:**

Concrete may be conveyed and placed by mechanically operated pressure equipment only with the written permission of the Engineer. Water cement ratio may not be increased above that for the same class of concrete placed by bucket and the slump shall be held to the minimum necessary for conveying concrete by this method.

k. **Bonding Mortar:**

Immediately before concrete placement begins, prepared surfaces except formwork, which will be in contact with the concrete to be placed, shall be covered with a bonding mortar as specified.

l. **Thickness of Layers:**

Concrete shall be placed in successive horizontal layers ranging in thickness from 15 to 90 mm. as directed by the Engineer the bucket loads, or other units of deposit shall be potted progressively along the face of the layer with such overlap as will facilitate spreading the layer to uniform depth and texture with a minimum of shovelling. Any tendency to segregation shall be corrected by shovelling stones into mortar then mortar on the stones. Such a condition shall be corrected by redesign of mix or other means, as directed by the Engineer.

m. **Bedding of layers:**

Bedding planes shall be approximately horizontal unless otherwise instructed.

n. **Compaction:**

Concrete shall be compacted with approved mechanical vibrating equipment until the concrete has been consolidated to the maximum practicable density, and is free of pockets of coarse aggregate, and fits tightly against all form surfaces and embedded materials.

**TYPE OF VIBRATORS:**

(i) Vibrators shall be the internal or immersion high frequency type, with speed of not less than 6000 revolutions per minute when immersed in the concrete. Vibrators shall be used in sufficient number of units and power of each unit shall be adequate to properly consolidate the concrete.

(ii) **Use of Vibrators:**

Vibrators shall be inserted in a vertical position at intervals of about 600 mm depending upon the mix; the equipment used, and continued experience on the job. Vibrators shall be withdrawn slowly. In no case shall vibrators be used to transport concrete inside the forms.

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**(iii) Successive Batches:**

In placing concrete in layers, which are advancing horizontally as the work progresses, great care shall be exercised to ensure adequate vibration, blending of the concrete between the succeeding batches.

**(iv) Vibrator Penetration of under layer:**

The vibrator shall penetrate the layer being placed and also penetrate the layer below while under layer is still plastic to ensure good bond and homogeneity between the two layers and prevent the formation of cold joints.

**(v) Vibrating Against Reinforcement:**

Care shall be taken to prevent contact of vibrators against reinforcement steel. Vibrators shall not be allowed to come in contact with reinforcement steel after start of initial set. Vibrators shall not be allowed to come in contact with forms of finished surface.

**(vi) Use of form attached Vibrators:**

The use of form attached Vibrators shall be used only with specific authorization of the Engineer.

**(vii) Use of Surface Vibrators:**

The use of surface vibrators will not be permitted under ordinary conditions. However, for thin slabs such as highways, runways, and similar construction surface vibration by specially designed vibrators may be permitted, upon the approval of the Engineer.

**(viii) Stone pockets and Mortar Poundage's:**

The formation of stone pockets and mortar poundage in corners and against form face shall not be permitted. If these occur, they shall be dug out, reformed and refilled to sufficient depth and shape for the rough blending, as directed by Engineer.

**CONSTRUCTION JOINTS AND KEYS:**

Concrete shall be placed continuously unless otherwise specified.

If stopping of concreting becomes unavoidable anywhere, the construction joint shall be made, where the work is stopped, concrete that is in the process of setting shall not be disturbed or shaken by traffic either on the concrete itself or upon the shuttering. Horizontal and vertical construction joints and bonding keys shall be located and shall conform in details to the requirements of the plans unless and otherwise directed by the Engineer. Where not described, the joint shall be in accordance with the following:

**(a) Column joint:**

In a column, the joint shall be formed 75 mm. below his lowest soffit of the beams joining to it.

**(b) Beam and Slab joint:**

Concrete in a beam shall be placed throughout without a joint but, if the provision of a joint is unavoidable, the joint shall be vertical and at the middle of the span. A joint in a slab shall be vertical and parallel to the principal reinforcement. Where it is

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unavoidable, the joint at right angles to the principal reinforcement, shall be vertical and at the middle of the span.

**CURING, PROTECTING, REPAIRING AND FINISHING:**

All concrete shall be cured by keeping it damp for the period of time required for complete hydration and hardening to take place.

Certain types of finish, or preparation for overlaying, concreting must be done at certain stages of the process and special treatment may be required for specific concrete surface finish.

**(i) Curing with water:**

Fresh concrete shall be kept continuously wet for a minimum period of at least 21 days since lapse of 24 hours after laying concrete. Quantity of water supplied shall be controlled so as to prevent the erosion of freshly placed concrete.

**(ii) Continuous Spraying:**

Curing shall be assured by use of an ample water supply under pressure in pipes, with all necessary appliances of hose (sprinklers to be used), unless otherwise specified or approved by the Engineer.

**(iii) Alternate Curing Methods:**

Whenever, in the judgement of the Engineer, it may be necessary, the continuous spray method may be omitted and a covering of sand, or other approved mulching such as wet gunny bags, which will prevent loss of moisture from the concrete, may be used. No type of covering will be approved which should strain or damage the concrete during or after curing period. Covering shall be kept continuously wet during the curing period.

**(iv) Curing compounds:**

Surface coating type-curing compounds shall be used only by special permission of and under the direction of the Engineer. Curing compounds shall be colourless / pigmented, liquid type, conforming to approved specifications. No curing compound shall be used on surfaces where future blending with concrete or painting is specified.

**(v) Ponding:**

For curing of concrete in pavement, sidewalks, floors, flat roofs or other level surfaces, the ponding method of curing is preferred. The method of containing the ponded water shall be approved by the Engineer. Special attention shall be given to edges and corners of the slabs to ensure proper protection to these areas. The ponded areas shall be kept continuously filled with water.

**(vi) Curing Equipment :**

All equipment and materials required for curing shall be on hand and ready for the use before concrete is placed.

**(vii) Protection of Fresh Concrete:**

Fresh concrete shall be protected by leaving forms in place for an ample period as specified later in this specification. Newly placed concrete shall be protected by approved means from rain, sun and winds. Steps as approved by the Engineer shall also be taken to protect immature concrete from damage by debris, excessive loading,

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vibration, abrasion or other materials etc. that may impair the strength and/or durability of the concrete. Workmen shall be warned against and prevented from disturbing green concrete during its setting period. If it is necessary that workmen enter the area of freshly placed concrete, the Engineer may require that bridges be placed over the area.

**(viii) Repair and Replacement of Unsatisfactory Concrete:**

Immediately after the shuttering is removed, the surface of concrete shall be very carefully one over and holes noticed shall be filled up and made good with mortar composed of one part of cement to one part of sand after removing any loose stones adhering to the concrete. Concrete surfaces shall be finished as described under the particular items of work. Superficial honeycombed surfaces shall be made good immediately after removal of shuttering, in presence of Architect's representative and superficial water and air holes shall be filled in. Unless otherwise instructed by the Engineer, the surface of the exposed concrete placed against shuttering shall be rubbed down immediately on removal of shuttering to remove fins or other irregularities.

Unsatisfactory concrete shall be cut out and replaced with new concrete, as soon as practicable after removal of forms. Anchors, tees, or dovetail slots shall be provided wherever necessary to attach the new material securely in place. Surface of prepared voids shall be wetted for 24 hours immediately before the patching material is placed. Use of an epoxy for blending fresh concrete used for repairs will be permitted upon written approval of the Engineer. Epoxies shall be applied in strict accordance with the instructions of the manufacturer.

**FINISHING - GENERAL:**

The specification is intended to cover the treatment of concrete surfaces of all structures. Area requiring special finish not covered by this specification may be clearly indicated on the drawings and specifications will be furnished.

**(a) Finish for Formed Surfaces:**

The type of finish for formed concrete surfaces shall be as follows, unless otherwise specified by the Engineer:

**(i) Cement plaster finish:**

The concrete shall be properly roughened immediately after the shuttering is removed, taking care to remove the laitance completely without disturbing concrete. The roughening shall be done by hacking. Before the surface is plastered, it shall be cleaned and wetted so as to give good bond between concrete and plaster.

- (ii) For surface against which backfill or concrete is to be placed, 'no' treatment is required except tie holes & repair of defective areas shall be patched with cement mortar.
- (iii) For surfaces below grade, which will receive waterproofing treatment, the concrete shall be free of surface irregularities, which would interfere with proper application of the waterproofing material, which may be specified for use.
- (iv) Surfaces which will be exposed when the structure is in service shall receive no special finish except repair of damaged or defective concrete, removal of fins and

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abrupt irregularities, filling of holes left by form ties and rods, and clean up of loose or adhering debris.

**(b) Finishing:**

Finishing of exposed concrete surface shall conform to the following.

**Smooth form finish:**

The form facing material shall produce a smooth, hard, uniform texture on the concrete; it may be plywood or other approved material capable of producing the desired finish. All ties, burns and fins are to be removed. Mix one part of Portland cement and one part fine sand with sufficient water to produce a stiff mortar. The mortar after drying shall match the rest of the surface in colour. Before application of mortar, concrete surface is to be dampened. Mortar is to be applied by firm rubber float or trowel, filling all surface voids. Compressing mortar into voids by using carborundum stone shall be continued till uniform colour and texture is produced. If the mortar surface dries too rapidly to permit proper compaction and finishing, apply a small amount of water with a sprayer. Quoted rate of exposed shuttering shall be inclusive of this treatment.

**(c) Finish for Unformed Surfaces:**

Surfaces which will be exposed to the weather and which would normally be a specified level, a horizontal surface or shows the slope required, the tops of narrow surfaces, such as stair treads, walls, curbs and parapets shall be sloped approximately 10mm in 300mm width, broader surfaces such as walkways, roads, parking areas and platforms shall be sloped about 1 in 50. Surfaces that will be covered by backfill or concrete, sub-floors to be covered with concrete topping, terrazzo or quarry tile, and similar surfaces shall be smooth screened and levelled to produce even surfaces. Surfaces which will not be covered by backfill, concrete or tile toppings such as outside desks, floors of galleries and sumps, parapet, gutters, sidewalks and slabs shall be consolidated, screened and flattened. Flattening may be done with hand and started as soon as the screened has attained a stiffness to permit finishing operations, and shall be the minimum required to produce surface uniform in texture and free from screened marks or other imperfections. Joints and edges shall be tooled as called for on the drawings or as directed by the Engineer.

**(d) Protection:**

All concrete shall be protected against damage until final acceptance by the Architect or his representative.

**CONCRETING IN HOT WEATHER:**

Concreting in extreme hot weather shall be avoided. Special care shall be exercised and measure undertaken when temperature on site exceeds 105° F or 40° C. Such measures shall include:

- (i) Provision of a shade for coarse aggregate so that the same do not absorb heat from the directly indenting rays of sun.
- (ii) Continuously wetting coarse aggregates to keep their temperature down, fog sprays.
- (iii) Providing a shade for the mixing machine.
- (iv) Depositing the concrete from the machine as quickly as possible.

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- (v) Adjusting water proportions throughout the day to account for water in the wet aggregate, giving desired strength and workability.
- (vi) (Covering the deposited concrete by a membrane as soon after the placing as possible without damaging the fresh concrete.
- (vii) Wet gunny bags shall be laid immediately after two hours of concreting on the top surfaces of slab and shall be kept wet for curing period.
- (viii) Use of retarder (2% of Calcium Chloride).
- (ix) Use of Zero Heat Portland Cement or even the Portland Pozzolana Cement.
- (x) Use of higher water cement ratio.
- (xi) Keep moist, the formwork continuously for the period of 2 hours at least.

On such days of hot weather, concreting records shall be kept of the atmospheric temperature and corresponding temperatures of concrete discharged from the mixing machine.

#### **CURING OF DIFFERENT ITEMS:**

For all the time during construction, curing shall be carried out especially from 7.00 AM to 7.00 PM even on holidays with proper manpower, necessary pumps and pipe lines, connections, etc.

Exposed surfaces of concrete shall be kept continuously in a damp or wet condition by ponding or by covering with a layer of sacking, canvas, hessian or similar material and kept constantly wet for at least seven days from the date of placing concrete in case of OPC and at least 10 days where mineral admixtures or blended cements are used. The period of curing shall not be less than 10 days for concrete exposed to dry and hot weather conditions. In the case of concrete where mineral admixtures or blended cements are used it is recommended that above minimum periods may be extended to 14 days. For the concretes containing PPC or Portland Slag Cements, period of curing may be increased.

#### **FORM WORK:**

##### **General:**

The form work shall conform to the shape, lines and dimensions as shown on the drawings and be so constructed as to remain sufficiently rigid during the placing and compacting of the concrete and shall be sufficiently tight to prevent loss of slurry.

- (a) All forms shall be checked frequently during the concreting operations and until removed so that they may be driven up if any settlement occurs.

The design, fabrication and erection of formwork are solely the responsibility of the Contractor. The formwork should be safe and stable to withstand dead load of concrete, men etc. Further, the form should yield security to the structure or its members.

- (b) **Materials:**

The selection of materials suitable for formwork shall be based on economy and consistency with safety and quality required in the finished work. Formwork shall be of timber, plywood, steel or any other materials as approved by Architect/Engineer-

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in-Charge whose decision in this respect shall be final. Props and shores shall be of steel, timber posts, bullies or any other material as approved by Architects.

- (c) Chamfer strips shall be placed in corner of forms to produce bevelled edges on permanent exposed surface, if specified.
- (d) Temporary openings shall be provided at the base of column forms and wall forms and at other points where necessary to facilitate cleaning and observation immediately before concrete is placed.

**(e) Mould Oil:**

Care should be taken to see that the formwork is perfectly cleaned and two coats of mould oil or any other approved material is applied before placing the concrete. Such coating shall be insoluble in water, non-staining and non-injuries to the concrete. It shall not become flaky or be removed by rain or wash water. Block boards or equivalent shall be used for shuttering columns, beams, etc. and steel sheets for slab shuttering will be allowed.

**(f) Chamfers and fillets:**

All concrete and angles exposed in the finished structure shall be formed with mouldings to form chamfers or fillets on the finished concrete. The standard dimensions of chamfers and fillets, unless otherwise specified, shall be 20 mm. Care should be exercised to ensure accurate mouldings. The diagonal face of the moulding shall be placed or surfaced to the same textures as the forms to which it is attached.

**(g) Vertical construction joint chamfers:**

Vertical construction joints on faces, which will be exposed at the completion of the project, shall be chamfered as above except where not permitted by the Engineer for structural or other reasons.

**(h) Reuse of Forms:**

Before reuse, all forms shall be thoroughly scraped, cleaned, joints examined and when necessary, repaired and the inside retreated to prevent adhesion, to the satisfaction of the Engineer. The Contractor shall equip himself with enough shuttering to complete the job in the stipulated time.

- (i) The contractor shall record on the drawing or a special register the date upon which the concrete is placed in each part of the work and the date on which the shuttering is removed there from. Striking of forms in the case of sides of beams, columns and slabs can be carried out after 24 hours of concreting. The striking of forms shall be done as para 2.12.4. Striking shall be done with utmost care without shock or vibration by gently easing the wedges. If, after removing the formwork, it is found that the timber is embedded in the concrete, it has to be cut out and made good with fine concrete. Due care shall be given to the provision of correct form work for holes and openings in the slabs, inserts, grounding cables, conduits and pipe sleeves, foundation or anchor bolts etc. as per approved drawings or as directed by the Engineer.

**CLEANING AND TREATMENT OF FORMS:**

The forms shall be carefully examined to see that they are vertical and horizontal and the joints are properly closed. If forms are to be reused, they should be carefully examined before such reuse, properly aligned and open joints shall be repaired and

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coated with crude oil. The centring planks for columns shall be joined together and provided with threaded bolts and nuts.

The centring and props for the various members shall be fixed in a workman like manner to be approved by the Engineer-in-Charge. They shall be of such size as the Engineer-in-Charge thinks fit and proper. The centring shall be removed only after the permission has been obtained from the Engineer-in-Charge. Props shall be supported on wedges placed on planks and the planks shall be 25 mm thick.

All rubbish, particularly chippings, shavings and saw dust shall be removed from the interior of the forms before the concrete is placed and the form work in contact with the concrete shall be cleaned and thoroughly wetted or treated with an approved composition. Care shall be taken that such approved composition is kept out of contact with the reinforcement.

- (a) In columns of any forms where access to the interior is not available otherwise, a sufficient area of one side shall be left loose so that it may be removed for cleaning out all chips, dirt, sawdust and other extra materials.
- (b) Where the shoring bores on the ground, the Contractor shall spread the load from shores by suitable brick platforms in order to prevent settlement.

#### **ARCHITECTURAL EXPOSED REINFORCED CEMENT CONCRETE:**

##### **(i) General:**

Generally specification for reinforced cement concrete work shall also apply to this type of work and additional specification set-forth below.

##### **(ii) Materials:**

- (i) Cement used for such work shall be of a uniform colour and obtained from one source of manufacture.

##### **(ii) Aggregate:**

##### **a) Fine Aggregates:**

Colour being an important consideration for exposed concrete, colour of sand used shall also be uniform through out the entire construction. Preferably total quantity required for the work shall be collected and well mixed together to a uniform shade.

##### **b) Coarse Aggregate:**

The colour of the aggregate shall be maintained the same through out. Unless otherwise specified, exposed concrete in walls, fences and parapets which are no-load bearing and are less than 120 mm. in thickness the maximum size of coarse aggregate shall be limited to 12 mm for which nothing extra shall be admissible. Flat and flaky pieces shall not be allowed.

##### **(iii) Reinforcement & Cover of the Concrete:**

Correct placing of the reinforcement with proper cover is important in all exposed work to avoid discoloration by rusting. The minimum cover specified in the Specification shall be maintained throughout.

Concrete blocks or spacers shall be sparingly used at exposed surfaces. When used, such blocks shall preferably be cast on vibrating tables or in some other similar

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manner so that it may match the concrete surface in texture and colour. Cover blocks of materials other than precast blocks shall not be allowed to be used.

**(iii) Construction of shuttering:**

All centering and framework shall be rigid and of robust construction. All vertical props shall be cut square at ends and shall rest on double wedges, placed on continuous horizontal runners on firm natural soil. Resting of props or runners on made up soil shall not be permitted on any account. All members of the formwork shall be closely fixed without any gap between them so as to safeguard against any settlement or displacement of shuttering at the time of concreting.

**i) Timber Shuttering:**

Formwork for exposed work shall be of seasoned wrought hard wood timber planks free from loose knots. The planks shall be 50 mm thick, 100 to 125 mm wide with tongue and groove joints, assembled to a pattern approved by the Architect. The formwork shall be so constructed, braced, and stayed as to remain absolutely rigid and true during and after concreting. The boards shall be planed to a suitable thickness in order that the surface against the concrete shall not be broken at joints between boards. Chamfers, grooves, drips mouldings, bevelled edges etc. shall be made in the form itself to the size, profiles and details called for on the drawings.

**ii) Plywood Shuttering:**

The contractor shall provide shuttering quality plywood not less than 12 mm thickness as per IS.4990 (type-I) of approved make or equivalent approved by the Architect in place of timber plank shuttering mentioned above for such location as called for by the Architects. The joints in plywood shuttering shall be located as directed by the Architects. Shuttering, centring and form work for all exposed concrete work like exposed columns, beams, ribs, slabs, chajjas, facia, walls etc. shall be of such finish and rigidity as to produce all faces fair and smooth, true to line level and plumb. No rendering or touching shall be permitted on these faces.

**iii) Steel shuttering:**

Steel shuttering for exposed concrete work shall be made of shuttering plates of standard sizes and to suit the pattern of exposed concrete indicated in Architect's drawings. The shutter plates used will be made of steel sheets strengthened at the edges and in middle to prevent sagging or any deflection and concrete deformity or dents and should fit with each other properly without any space or groove being left between adjacent plates to avoid and leakage of concrete slurry. If any concrete projects out between plates this will be neatly cut away.

The contractor shall be required to produce details of working showing the general construction of formwork and panels with details such as nail position and holes for supports that may be required; nail heads shall be positioned as instructed by the Architects. Grooves and chamfers shall be formed as shown on the drawings without any extra cost.

Any holes for the supports, which the contractor may need, shall be permitted only if approved by the Architects. All such holes shall be subsequently filled in carefully as to match with the other surface. Walls, columns etc. shall generally be cast to the full height in one operation and the formwork shall be provided accordingly. If permitted by the Architects, these may be completed in two or more heights when the formwork

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shall be carefully and correctly raised for further height so as to ensure a neat joint without disturbing the pattern. Any groove desired by the Architect at the joint shall be provided by the Contractor at no extra cost. .

**(iv) Coating for shuttering:**

Shuttering oil, colourless and emulsifiable in water shall be used for oiling the woodwork, when only a thin film shall be neatly applied avoiding collection at one place. Any mark left by the shuttering oil shall be washed clean.

**(v) Measurements and proportioning of concrete materials:**

This shall be as laid down generally for R.C.C. work. In no case extra dust or sand or additional water shall be allowed with the intention of getting better finish, which shall only be obtained by erecting centring as specified above and proper vibrating of the mix after placing. In no case, the slump limit, specified in the Specification shall be exceeded.

**(vi) Preparation for placing concrete:**

Special care is essential to see that all saw dust, chips, nails or any foreign material is washed out or otherwise removed from the shuttering.

**(vii) Mechanical vibration:**

All concrete for exposed concrete work shall be vibrated, using needle vibrators - 30/32 mm. Surface or trough vibrators may be permitted to be used for thin slabs. External vibrators for walls may be allowed but this shall be done carefully to safeguard the displacement of the shuttering. Vibrators shall only be operated by skilled labour; over or under vibration shall not be permitted. Any spillage, or leakage, which is unavoidable and which flows down the exposed concrete surfaces, shall be immediately washed away with clean water and brush. Exposed concrete members shall be finished to desired surface while the concrete is still green.

**(viii) Curing and protection of concrete:**

Curing will be done with clean water, so as not to discolour the concrete. All exposed concrete work shall be properly protected by Alkathene film, gunny bags, wooden boards etc. so the surfaces and edges are not damaged or discoloured till the entire construction is handed over, at no extra cost. All such damages shall be set right or replaced by the contractor at his own cost; the contractor is deemed to have considered this in quoting his rate.

**(i) Removal of shuttering:**

Striking and removing of formwork for exposed concrete shall be done very carefully without damaging the surface or edges. All such damages shall be set right or replaced by the contractor as his own cost.

**(ii) Finishing:**

Finishing of exposed concrete surface shall be as specified.

Exposed concrete surface shall on no account be permitted to any sort of repairs or patching after striking the formwork. In the event of any portion not coming up to standard, this shall be taken down by the contractor at no extra cost. Decision of the Architects as to the rejection of such work shall be final and binding on the contractor.

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**STRIPPING TIME:**

In normal circumstances (generally where temperatures are above 20° C) and where Ordinary Portland Cement is used, forms may generally be removed after expiry of following periods:

Type of Formwork		Minimum Before Formwork	Period Striking
(a)	Vertical formwork to columns, walls, beams	16 - 24 h	
(b)	Soffit formwork to slabs (Props to be refixed immediately after removal of formwork)	3 days	
(c)	Soffit formwork to beams (props to be refixed immediately after removal of formwork)	7 days	
(d)	Props to slabs: (a) Spanning up to 4.5 m. (b) Spanning over 4.5 m.	7 days 14 days	
(e)	Props to beams and arches: (a) Spanning up to 6 m (b) Spanning over 6 m	14 days 21 days	

The number of props left under, their sizes, load and disposition shall be such as to be able to safely carry the full dead of the slab, beam or arch as the case may be together with live load likely to occur during curing or further construction.

However, this period may be increased or decreased at the discretion of Architects. In case when the cube strengths at seven days are found to be low or in the cases when other cements are used, the curing period and stripping time for forms and removal of props may have to be extended. This shall be decided by the Architect and the contractor shall not claim any extra costs for such increased periods of curing and stripping of forms etc. Special care shall be taken while removing the cantering of cantilever slab, canopies, portal frames, folded plates construction etc. Stripping time for such special structure as shell roofs etc. shall be determined from tests of stripping cubes taken especially for the purpose. These cubes shall give strength of 75% of the 28 days strength.

For rapid hardening cement 3/7 of the above period will be sufficient in all cases except vertical sides of slabs, beams and columns, which should be retained for 24 hours.

**Note:**

The props left under shall mean that the form work for slabs and beams soffits at 3 days and 7 days respectively can be removed only if the same can be done without disturbing the props which are required to support the slab or beam completely. In normal cases this will mean that period for removal of formwork for slabs and beam soffits will be 7 days and 14 days respectively.

**PROCEDURE WHEN REMOVING THE FORMWORK:**

All formwork shall be removed without such shock or vibration as would damage the reinforced concrete. Before the soffit and struts are removed, the concrete surface shall be exposed, where necessary, in order to ascertain that the concrete has

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sufficiently hardened. Proper precautions shall be taken to allow for the decrease in the rate of hardening that occurs with all cements in the cold weather.

#### **CAMBER:**

It is generally desirable to give forms an upward camber to ensure that the beams do not have a sag when they have taken up their deflection, but this should not be done unless allowed for in the design calculation of the beams.

#### **TOLERANCES:**

The Contractor shall, before putting any concrete in any unit, check all dimensions according to the drawing governing the accuracy of the dimension of all the units and the necessary formwork shall be approved by the Engineer-in-charge and if any error is found in dimensions, the Engineer-in-charge will not allow in any case more than the tolerances specified as below and any unit which does not comply will be liable to rejection at the discretion the Engineer-in-charge.

The formwork shall be designed and constructed to the shapes, lines and dimensions shown on the drawings within the tolerances as given below. The tolerances in footings apply to concrete dimensions only and no to positioning of vertical reinforcing steel or dowels.

(a)	Deviation from specified dimensions of cross sections of columns and beams	- 6 mm +12 mm
(b)	Deviation from dimensions of footings: (i) Dimensions in plan (ii) Eccentricity  (iii) Thickness	-12 mm 0.2 times the width of the footing in the direction of deviation but not more than 50 mm. +0.05 times the specified thickness

#### **TRANSPORTING AND PLACING OF CONCRETE:**

The concrete shall be mixed in quantities required for immediate use and shall be deposited on the sub-grade/sub-base to the required depth and width of the pavement section in successive batches and in continuous operation without the use of intermediate form between the joints. Care shall be taken to see that no segregation of materials results whilst the concrete is being transported from the mixer to the place where it is to be deposited. The spreading shall be as uniform as possible to avoid re-handling of concrete. Where, however a certain amount of redistribution is necessary, it shall be done with shovels and not with the rakes.

While being placed the concrete should be rodded with suitable tools so that formation of voids or honeycomb pockets is prevented. The concrete shall be well placed and tamped against the forms and along all joints.

#### **COMPACTION OF FLOOR CONCRETE:**

The concrete at the side of the forms and between the reinforcements at joints and at corners to be compacted with internal vibrator (needle vibrators) to avoid honeycombing and to get perfect compaction at these locations.

The vibrating screed shall rest on side forms and it shall be lowered vertically on the concrete surface, (evenly spread to an appropriate level above the base) to provide the required surcharge for compaction; allowed to remain in position for few seconds until

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compaction is completed, then lifted vertically and lowered on to the adjacent strip of un-compacted concrete. The amplitude of vibration of the screed shall not be less than 1.5 mm and speed of travel not more than 0.60 m per minute. The screed shall again be taken slowly over the surface, sliding with its axis slightly fitted away from the direction of sliding and operation repeated until the required dense, close knit textured finish surface is obtained.

**Notes:**Precautionary measures to be taken before starting concrete floor.

(a) The working of vibrators shall be regularly checked and standbys shall always be maintained for emergency use.

(b) The segregated particles of coarse aggregates which collect in front of the tamper or screed shall be thrown outside the forms. Under no circumstances shall such segregated particles be carried forward and pushed on to the base in front of the mass.

### **CONCRETE FLOOR FINISHING:**

Immediately after completing the compaction by screed vibrator and excess water has disappeared but while the concrete is still plastic, the floor top surface shall be tested for true-ness with a 3.65 M long straight edge (Aluminum Box Section).

The straight edge shall be held in successive positions parallel to the guide channels in contact with top surface of floor laid and the whole area gone over from the one side of the floor to the other. Advance along the floor shall be in successive stages of not more than one half length of straight edge. Any area of the depressions found shall be scooped to a depth of 40 to 50 mm filled immediately with freshly mixed concrete, struck, compacted and refinished. High areas shall be cut down and refinished. The straight edging and re-floating shall continue until the entire surface is found to be free from observable departures from straight edge and top surface has the required levelled surface.

The floor top surface shall be re-tested for trueness before the concrete begins to set with the 3.60 M long master straight edge (Aluminum Box Patti). Any irregularity in surface to be rectified.

### **PREPARATION OF SURFACE AND USE OF FLOOR HARDNER (FIRST DRY SHAKE):**

Following types of floor hardeners are used for increasing strength of concrete floors.

- Ironite based
- Silica / Quartz based
- Carborandum based

The quantity of floor hardener shall be used as specified by the Consultants (or as per manufacturers specification) and according to light / medium / heavy-duty floor as specified.

Scrap the concrete deposited, if any, on the top of side form during concreting. As soon as concrete is firm enough to support the weight of workmen and their equipment and no water is observed on surface; apply first shake of hardener evenly using 2/3 of total mix e.g. 2/3 of 7.5 Kg./Smt. Treat areas adjacent to walls and columns first, spread the materials evenly by sprinkling at right angles in two passes close to floor level. Do not broadcast (spread) the hardener from a station position but use a wooden scraper to spread the hardener. Alternatively, a mechanical spreader can be used for better application.

### **FLOATING: (With Finishing Machine Having DISC)**

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Power float the shake application promptly, work near wall, columns and door area first. Avoid excessive floating but ensure that the shake application is completely wetted and incorporated in to the base slab.

**C-6 Form work for “off the form exposed concrete surfaces having board marked pattern and time texture.”**

Relevant specification of form work above (**Given in C-5** above) shall be made applicable.

Concrete surface, which are to be “form finish shall be cast in an approved form work and shall be free from honey combined, fine, projections, and air holes. All external angles to form finish concrete surfaces shall be chaffed if and as directed. All interesting flush surfaces, surfaces horizontally or vertically between columns and beams of other structural members shall be separated by grooves if and as directed by the Engineer-in-charge.

The pattern of the form boards, the disposition of construction joints and lifts, and the incorporation of recessed or raised joints shall be carefully studied by the contractor for its proper implementation.

The contractor shall submit shuttering drawings and details of pattern and the method of forming joints in the exposed (form finish) concrete to the Engineer-in-charge. For his approval and all changes and modification specified by the letter shall be appropriated by the former and final approval whereof obtained from the Engineer-in-charge.

No work of form finished exposed concrete shall be carried out until the contractor has produced acceptable sample of shuttering and concrete to the approval of the Engineer-in-charge.

Utmost care shall be then be constantly exercised by the contractor in the :

- a. Design workmanships and fixing of form work.
- b. Control of concrete ingredients, mixing and placing.
- c. Adequate technical supervision of all process involved.

Listed below are some form work specifications, for form finished exposed concrete to be used on site as directed by the Engineer-in-charge.

**i. Smooth Board Surfaces :**

The smooth board marked surfaces are produced by new dressed tongued and grooved boards of uniform thickness of not less than 45 mm. These boards should be brought and dressed on both faces as well as on all side.

**ii. Rough Board Surfaces :**

A rough texture is obtained by the use of new sawn boards with dressed square edges.

**Steel Mould Surface:**

Steel moulds must be rigid enough are perfectly plane and clean. They must be painted with a protective point and absolutely free from rust or have a special section at their edges to prevent cement leakage and produce a water tight joint.

This type of form work is to be entrusted to a skilled and specialized manufacture who has produce satisfactorily similar form work and who must be approved by the Engineer-in-charge.

In all type of form work to form finished exposed concrete. Only non-staining mould oil supplied by an approved manufacturer will be used.

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The repetitive usages of the same form work to cast form finished exposed concrete shall be as decided by the Engineer-in-charge and no case form work not guaranteed to produce the required form finish to the satisfaction of the Engineer-in-charge shall be used.

The exposed concrete shall have uniform finish. The finish of the concrete when shuttering and form work is removed will generally be without blemish and will be such as will not require touch up. Slight touch up a small work or two if necessary shall be carried out immediately on removal of form work by 1.1 proportions. This shall be carried out expertly on removal of form work with entire surface.

**C-7 Fabricating placing reinforcement in position :**

**Fabrication:**

The reinforcement bars shall be out to be required length including necessary bends hooks, overlaps, etc. as shown on the plan or as directed by the Engineer-in-charge and shall conform to I.S. 2502-1963 or as revised from time to time. Details of length and bending diagrams shall be got approved from the Engineer-in-charge.

**Placing and Binding:**

All reinforcement shall be accurately placed in position with spacing as shown in the drawing and firmly held so during placing and setting of concrete. The bars shall be tied diagonally both ways, at all inter-sections with M.S. binding wire of 1.22mm or 1.63mm dia (16 or 18 gauge). Spot welding instead of tying brass by wires will be permitted by the Engineer-in-charge, if required. Spacing of bars shall be maintained by means of stays, blocks, tiles, spacers, hangers or other approved supports or devices at sufficiently close intervals.

All bars protruding from concrete to which other bars are to be spliced and which are likely to be exposed for indefinite period shall be protected from rusting by thin coat of cement wash.

**Welding:**

Welding (instead of overlaps) by gas or electricity will be permitted under suitable conditions and with suitable safe-guards. In case such permission is granted, relevant Indian Standards for welding of steel reinforcement bars including carrying out necessary tests shall be followed.

**Inspection:**

No concrete shall be deposited unless the Engineer-in-charge has inspected the reinforcement work, recorded measurements, and given permission to place the concrete. After the approval of the reinforcement by the Engineer-in-charge, it will be the contractor's responsibility to see that reinforcement is not disturbed from its position till the concreting is completed.

**C-8 Fixing Expansion Joints :**

The expansion joints shall be provided in R.C.C. structural members:

- a. For the joints between twin internal beams of RCC frame structure, copper strip of 1.5mm thickness and width and shape as shown in the detailed drawing shall be placed near the bottom in the first beam such that one Kg. of the specified width is embedded in the beam and "U" fold (of 80mm depth unless otherwise specified) will come in the joint.

The "U" shape gap of the copper strip shall be filled with poured bituminous joint filler and nearly finished on top. Before casting of the jointing member pre-molded bitumen

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joint filler or required thickness shall be placed in position as directed and concrete then cast, embedding the other leg.

- b. The joint between the twin terrace beam shall be prepared in a manner similar to (1) above except that the raised concrete edge shall be provided and the copper plate shall be fixed in the raised edge as directed. It shall be covered by lead flashing 1.5mm thick fixed to one seat with copper screws to the wood blocks embedded in the concrete as shown in the detailed drawing.
- c. For the joints between twin internal or external columns, white casting the first column, one leg of each of the copper strips of 1.5mm thickness shall be embedded into the column and "U" fold will come in the joints nearer the exterior faces of the column. The copper strips shall be fixed with hold fast of copper rod as shown in the detailed drawing. Before casting the second column pre-molded bituminous joint filler shall be placed against the face of the first column all along between the two steps as directed by the Engineer-in-charge.

#### **C-9 Structural steel work**

All steel shall be tested and Indian approved manufacturers. One sample would with exact dimensions of all the members of the truss shall be got approved by the Engineer before erecting and fixing the same. Welding shall be properly done to the exact length and shall be got approved by the Engineer and welding shall conform to IS - 816-1956 or as revised from time to time. This items including providing, supplying, fabricating and erecting the same in proper position.

The entire steel surface shall be made clear and free from rust, scales, dust etc. before painting. All the steel work shall be painted with one coat of anti-corrosive paint and two coats of approved enamel paint and shade complete as directed.

There shall be no holes left after welding. The welding shall be carried out by welders, well experienced in the job and possessing certificate. The cutting should be smooth and the steel shall be made perfectly straight as required. The bolts, nuts, washers, etc. used shall be of best approved quality. After welding is done the welding surface shall be made clear by removing all the flux by chipping hammer wire brush.

The entire steel structure after erection shall be in perfect line and level and plumb and shall structure after erection shall be in perfect in line and level and plumb and shall be approved by the Engineer-in-charge before the sheeting work is started.

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## DETAILED SPECIFICATION FOR THE ITEMS OF WORK TO BE CARRIEDOUT

**NAME OF WORK** :-Work of Construction of PQC approach road with SWD from NH-48 at GIDC, Ankleshwar.

**ITEM NO. 01 OF SCHEDULE B1:**

**Box cutting the road surface to proper slope and camber for making a base for road work including removing the excavated stuff and depositing on the road side slope as directed upto 50Mt.lead. (Use This material in Filling Embankment item No-2)**

**SCOPE**

This item shall consist of excavation, removal and satisfactory disposal of all materials necessary widening of Road, Re-sectioning & Profile correction of Road., Side Shoulder & Road by using cutting stuff received from cutting, in accordance with the requirement of these specification including all lead and lift and conformity with the lines, grades and cross sections shown in the drawings or directed by the engineer- in – charge. This work shall include the hauling and stacking of or hauling to sites of embankment for land scaping Island, Road work & side shoulder construction etc. of suitable cut materials as required and also the disposal of unsuitable cut materials in specified manner, including

all lead and lifts including trimming and finishing of the road to specified dimensions or as directed by the engineer in charge including rolling and watering etc. complete.

**1) CLASSIFICATION OF EXCAVATED MATERIALS:**

**1.1.) Classification:**

All materials involved in excavation shall be classified by the Engineer in the following manner:

- i) All sorts of soil and soft murrum.
- ii) Ordinary Rock (not requiring blasting)
- iii) Hard Rock (requiring blasting)
- iv) Hard Rock (blasting prohibited)
- v) Marshy Soil

**1.2.) AUTHORITY FOR CLASSIFICATION:**

The classification of excavation shall be decided by the Engineer and his decision shall be final and binding on the Contractor. Merely the use of explosives in excavation will not be considered as a reason for higher classification unless blasting is clearly necessary in the opinion of the Engineer.

**2) CONSTRUCTION OPERATIONS:**

**2.1.) SITE CLEARANCE:**

The land width on which the earth work is to be done, shall be cleared from all trees, bushes, shrubs, rubbish and other objectionable materials. Useful material shall be arranged in convenient stacks and un-useful material shall be burnt or other wise disposed off by contractor at his own cost. MoRTH specification clause No.201 shall be also followed.

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**2.2.) SETTING OUT:**

After the site has been cleared, the limits of excavation and the alignment of the road shall be set out true to lines, curves, slopes, grades and sections as shown on the drawings or as directed by the Engineer in charge. The contractor provide all labour and materials such as strings, time pegs, stones etc. required in connection with the setting out of works and establishment of Temporary & permanent Bench mark, centre line stone & other marks. The contractor shall be responsible for the maintenance of the bench mark and other marks, and stacks as long as in the opinion of the Engineer in charge. Before start of the work, toe line of embankment shall be marked on ground.

**2.3.) COMPACTING ORIGINAL GROUND:**

The original ground, where construction of embankment for land scapping Island, Road work, side shoulders and water way to be done, with excavated stuff shall be consolidated by rolling as directed by Engineer in charge and in accordance with MoRTH specification Clause No.305.3.4.

**2.4.) EXCAVATION:**

All excavation shall be carried out in a manner approved by the Engineer in charge and in conformity with the directions laid herein under and in manner approved by the Engineer in charge. The work shall be so done that the suitable materials available from excavation are satisfactory utilized as decided upon beforehand.

While planning or executing excavations, the contractor shall take all adequate precaution against soil erosion, water pollution etc. as per MoRTH Clause No.306 & take appropriate drainage measures to keep the site free from water in accordance with the MoRTH Clause No.311.

The excavation shall conform to the lines, side slopes, and levels shown on the drawings or directed by the Engineer in charge. The contractor shall not excavate outside the limit of excavation subject to the permitted tolerance, any excess depth/width excavated beyond the specified levels/ dimensions on the drawing shall be made at the cost of contractor with suitable material of characteristics similar to that removed and compacted to the requirements of MoRTH clause No.305.

Care shall be taken to see that excavation is arranged in a safety way so that there will be no risk to the work or workmen. If slides occur in cutting during the process of the construction, they shall be removed at the cost of contractor as ordered by the Engineer in charge. While planning or executing excavations, the contractor shall take all adequate precautions against soil erosion, water pollution etc. as per MoRTH specification clause no.306.

All debris and loose materials on the slopes of cutting shall be removed. No back filling shall be allowed to obtain required slopes excepting that when boulders or soft materials are encountered in instruction of the Engineer in charge & the resulting cavities filled with suitable materials and thoroughly compacted in an approved manner.

For rock excavation, specifications under MoRTH clause No. 301.3.5 shall be followed.

**2.5.) DISPOSAL & UTILIZING OF EXCAVATED STUFF:**

All the excavated material shall be property of the corporation. The material obtained from the excavation of roadways, widening work, SWD, foundation for structures etc. shall be used for the work of embankment, for land scapping Island, Road work, embankment for side shoulder of roads & embankment work as directed by the Engineer in charge including leveling & spreading with all lead and lift and no extra payment shall be made for the same.

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Unsuitable and surplus materials not intended for use shall be removed from site of the work to outside estate limit or within estate limit by suitable means. No extra payment shall be made for the same.

The useful excavated materials shall be used in embankment and it shall be directly deposited at the required location in specified layer. No handling or conveyance charges shall be paid. If no DGIDCIEA land is available, but the excavated useful stuff is to be stacked temporarily before use under the same agreement, the contractor shall make his own arrangements for the stacking of this material temporarily on private land or land of plot holders, by paying rent etc. without claiming any compensation. Surplus material not required for use on embankment or unsuitable materials may be used of his own cost to uniformity widen embankment to flatten slopes and fill low places in the road land or plot land, if so permitted by the Engineer in charge. Material not required for any use whatsoever may be disposed off by the contractor at his own cost in a manner approved by the Engineer in charge.

The excavation shall be finished neatly, smoothly and evenly to the correct lines, curves, grades sections and side slopes as shown on the plans or directed by the Engineer. Any damage to the existing works or work in hand caused as a result of his operations or negligence shall be made good by the contractor at his own cost. Road side gutters shall be excavated to the specified section.

#### **2.6.) SPREADING THE EXCAVATED STUFF IN LAYERS:**

The excavated stuff shall be spread uniformly over the entire width of embankment for land scapping Island, Road work, side shoulders in layers not exceeding 250 mm in loose thickness. Successive layers of embankment shall not be placed until the layer under construction has been thoroughly compacted to the requirements set down in the detailed specifications of MoRTH

Clods or hard lumps of cutting stuff shall be broken as directed by the Engineer in charge.

#### **2.7.) DEWATERING:**

If water is met with the excavation due to springs, seepage, rain etc. shall be removed by suitable diversions, pumping or bailing out and the excavation part kept dry whenever so required or directed. Care shall be taken to discharge, the drained water into suitable outlets as not to cause damage to the works, demarcated plots, crops any other property. Due to any negligence on the part of the contractor, if any such damage is caused, it shall be the sole responsibility of the contractor to repair/ restore to the original condition at his own cost or compensate for the damage. MoRTH Specification Clause No. 304.3.3 shall also apply.

#### **2.8.) PUBLIC SAFETY:**

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

#### **2.9.) PRESERVATION OF PROPERTY:**

The contractor shall undertake all reasonable precautions for the protection and preservation of any or all existing road side trees, structures, drains, sewers, pipes, conduits and any other structures under or above ground, which may be affected by construction operations and which in the opinion of the Engineer in charge shall be continued in use without any change. Safeguards taken by the contractor in this respect, shall be got approved by him from the Engineer in charge. However, if any of these objects is damaged by reason of the contractor's negligence, it shall be replaced or restored to the original condition at his expense. If the contractor fails to do so, within the required times as directed by the Engineer in charge or if, in the opinion of the Engineer, the actions initiated by the contractor to replace/ restore the damage

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objects are not satisfactory, the Engineer shall arrange the replacement/ restoration directly through any other agency at the risk and cost of the contractor after issuing a prior notice to the effect.

## **2.10.) REPARATION OF CUT FORMATION**

The cut formation, which serves as a sub-grade, shall be prepared to receive the sub – base / base course as directed by Engineer.

Any unsuitable material encountered in the sub grade level shall be removed as directed by Engineer in charge & replace with suitable materials compacted in accordance with the MoRTH clause no.305.

In rock formations, the surface irregularities shall be corrected and the level brought up to the specified elevation with granular base material as directed by the Engineer in charge, laid and compacted in accordance with the respective specifications of these materials. After satisfying the density requirement, the cut formation shall be prepared and to receive the sub-base / base course in accordance with MoRTH Clause No.310 & 311 to receive the sub-base/ base course.

## **2.11.) FINISHING OPERATIONS:**

Finishing operations shall include the work of properly shaping and dressing all excavated surface/embankment works, and shall conform to MoRTH specification Clause No.301.7 and 305.3.9.

The finished cut surface shall satisfy the surface tolerance described in MoRTH Clause 902.

### **3) QUALITY CONTROL OF WORK:**

Control on the quality of materials and works shall be exercised by the Engineer-in-charge in accordance with these specifications and general specification for quality control on works and materials attached herewith. All testing charges shall be borne by the contractor.

### **4) ARRANGEMENT FOR TRAFFIC:**

MoRTH specification Clause –112 shall be applicable.

### **5) MODE OF MEASUREMENT & PAYMENT:**

The contract rate shall be for a unit of one cubic meter for the strata mentioned in the wording of the item of excavation acceptable completed and limited to the dimensions shown on the plans and construction of embankment/ side shoulders with cutting stuff, acceptably completed and limited to the dimensions only. Excavation shall be measured in its original position by taking cross sections before the work starts and after it is entirely completed, or levels shall be taken before and after construction. The quantity shall be worked out by the average end area method. Where it is not feasible to compute volumes by this method, because of erratic location of isolated deposits, the volumes shall be computed of the strata changes, the contractor shall bring this to the notice of the Engineer-in-charge who will then verify and if necessary take levels for the changed strata for purposes of measurements.

Levels and sections of the ground shall be taken in the presence of the contractor or his authorized agent before the excavation is started so as to serve as the basis of measurement. The contractor or his representative shall sign the field book in token of his acceptance of the levels. If there is any disagreement the contractor shall inform of it in writing to the officer concerned with the specific reference to the sections before starting further work. Once the work is started, no cognizance of any complaint shall be taken. Merely not signing of the field book shall not be deemed as disagreement.

The contract unit rate for this item shall be payment in full for carrying out the required operations including full compensation for setting out, transporting the excavated materials & disposing the same on site of the embankment/ work of side shoulder etc. as directed within all

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lead and lift. trimming bottoms and slopes of excavation, dewatering, keeping the work free of water as per clause 311, all materials, labours, tools, equipment, safety measures all testing charges, making arrangement for traffic and incidentals necessary to complete the work to the specifications above and all leads and lifts. No extra payment shall be made for the cutting stuff used in embankment/ shoulders.

**The contract unit rate shall be for a unit of one Cubic meter of finished work at the site of work.**

**ITEM NO. 02 OF SCHEDULE B1:**

**Earth work in embankment in 500 mm murrum/ yellow earth brought from outside having Effective CBR must be achieve 13.5 % incl. braking clods dressing, tempering, watering, rolling, consolidation of subgrade to required etc. incl.all conveyance and spreading, watering, rolling consolidation of layers at OMC to required density using power roller 8 to 10 tons incl. filling of depressions that occurs all labour material tools & plants as directed. as directed by Engineer-in-charge.**

**1) SCOPE:**

**305.8.1** This item shall consist of compacting, rolling, watering and dressing the earth work (having minimum CBR 13.5%) in the required layers, not exceeding 20 cms in loose thickness, to be done for construction of embankments, side shoulders and miscellaneous back fill with excavated stuff under this contract. The consolidation of earth work shall be carried out in accordance with the requirements of these specifications and in conformity with the lines, grades and cross sections shown in the drawings or as directed by the Engineer-in-charge. **If the Soil of required CBR is not available in surrounding area of proposed site, then the contractor have to provide treatment like soil stabilization to existing Soil to achieve the CBR as required in item description and for that no any extra payment to be made by GIDC**

The compaction of earth work done with excavated stuff shall be carried out in layers not exceeding 20 cms. in loose thickness or as directed by the Engineer-in-charge.

M.D.D. test of excavated soil as per requirement shall be carried out at approved Govt. laboratory by the contractor at his own cost.

Moisture content of each layer of the loose excavated stuff of soil, soft murrum etc. shall be checked in accordance with IS:2720 (PART-II) and suitably adjusted by sprinkling additional water from a hose line, truck mounted water tank or other approved means so that at the time of compaction, it is from 1% to 2% below O.M.C., corresponding to IS:2720 (PART-VII). While adding water, due allowance shall be made for evaporation losses. After adding the required amount of water, the soil shall be processed by means of harrows, rotary mixers or as otherwise approved until the layer is uniformly wet.

Clods or hard lumps of earth shall be broken to have minimum size of 150mm or as directed.

Immediately thereafter, rolling shall be started with vibrator roller of 80 to 100 KN static weight with plain drum or heavy pneumatic tyred roller of minimum 200 to 300 KN weight

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having tyre pressure 0.70 MN / M2 of other approved plant. Rolling shall commence at the edges and progress towards the centre longitudinally except that on super elevated portions, it shall progress from the lower to the edge parallel to the centre line of the pavement, Each pass of the roller shall uniformly overlap not less one third of the track made in the proceeding pass. During rolling, the grade and camber shall be checked and any high spots or depressions which become apparent corrected by removing or adding fresh material.

Utmost care shall be taken during the rolling work so that earth do not get disturbed and pushed out so as to cause unevenness lumps, irregularities etc. in road surface. Each layer of the earth work shall be thoroughly compacted to densities specified in table below:

**TABLE**

<b>Sr. No.</b>	<b>Type of work</b>	<b>Relative compaction as percentage of maximum laboratory dry density as per I.S.2720 (Part- 8)</b>
1	Subgrade and earthen shoulders	Not less than 97 %
2	Embankment	Not less than 95 %
3	Expansive Clays	Not allowed
	a) Subgrade and 500 mm portion just below the sub-grade	
	b) Remaining portion of embankment	90 - 95 %

When density measurements reveal any soft areas in the embankment, further compaction shall be carried out as directed by the Engineer-in-charge. If in spite of that, the specified compaction is not achieved, the materials in the soft areas shall be removed and replaced by approved material compacted to the density requirements and satisfaction of the Engineer-in-charge.

The surface of any layers of earthwork on completion of compaction shall be well closed free from movement under compaction plant and from compaction planes, ridges, cracks or loose, segregated or otherwise defective areas shall be made good to the full thickness of layer and re-compacted.

**ITEM NO. 03OF SCHEDULE B1:**

**Graded Granular sub base (GSB)Providing & laying Closed Graded Granular sub base (GSB) laying in uniform layer(each layer should be less than 200 mm)of graded granular material consisting of black trap machine cut crushed stone aggregate as per grading - V given in table 400-1 of the specification MORT&H and compactor to the required density with 8 - 10 tonne vibratory roller with plain drum or heavy pneumatic tyred roller of minimum 200 to 300 KN weight in all seasons as per MORT&H , maintaining the required slope & grade during the operation as approved by the engineer in charge & watering to the proper moisture content and sprinkled with the help of truck mounted water tank fitted with suitable arrangement. (fully saturated having CBR value minimum 30)**

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**SCOPE :**

This work shall consist of laying and compacting well graded granular materials or suitable materials for constructing the sub-base & side shoulder on prepared sub-grade in accordance with the requirements of these specifications. The graded granular materials or suitable material shall be laid in three layer as sub-base or lower sub-base and upper sub-base as necessary according to lines, grades, and cross sections shown on the drawing or as directed by the Engineer-in-charge.

**MATERIALS: SOURCE:**

The graded granular materials or suitable materials shall be obtained from outside sources/ area other than G.I.D.C. land. The contractor will have to make his own arrangement to get sources/ area for obtaining the graded granular materials/materials of the approved quality with all leads and lifts at his own cost. The general specifications for collection of road materials attached herewith shall be also followed.

The source/quarries arranged by the contractor to obtain the graded granular materials/suitable material shall be got approved from the Executive Engineer prior to use in the work.

The sample of graded granular materials/ suitable materials collected from approved quarries shall be got tested at Govt. recognized laboratory as may be directed to the contractor at his own cost. The results shall conform to the standard requirements set down hereunder. The graded granular materials/materials of the approved quality shall be only permitted for use in the work.

**GENERAL REQUIREMENTS:**

The materials to be use for the work shall be natural graded granular materials. The graded granular materials shall be free from organic or other deleterious constituents.

If inferior quality of graded granular materials is used in the work, same shall be removed by the contractor at his own cost.

**PHYSICAL REQUIREMENTS:**

TABLE 400-1. GRADING FOR GRANULAR SUB-BASE MATERIALS

IS Sieve	Percent by weight passing the IS sieve
<i>Designation</i>	<i>Grading V ( AS PER MORTH 5<sup>TH</sup> REVISION )</i>
75.0 mm	100
53.0 mm	80-100
26.5 mm	55-90
9.50 mm	35-65
4.75 mm	25-50
2.36 mm	10-20
0.85 mm	02-10
0.425 mm	00-05
0.075 mm	---
CBR Value (Minimum)	30

**Note :** The material passing 425 micron (0.425 mm) sieve for all the three gradings when tested according to IS : 2720 (Part 5) shall have liquid limit and plasticity index not more than 25 and 6 percent respectively.

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**1) Strength of sub-base**

It shall be ensured prior to actual execution that the material to be used in the sub-base satisfies the requirements of CBR and other physical requirements when compacted and finished.

When directed by the Engineer, this shall be verified by performing CBR tests in the laboratory as required on specimens remoulded at field dry density and moisture content and any other tests for the "quality" of materials, as may be necessary.

**CONSTRUCTION OPERATIONS:****PREPARATION OF SUB-GRADE:**

Immediately prior to the laying of sub-base, finished sub-grade/ sub-base shall be prepared by removing all vegetation and other extraneous matter, lightly sprinkled with water if necessary and rolled with one or more passes of 80/100 KN smooth roller as directed by the Engineer-in-charge.

**SETTING OUT:**

After completion of the sub-grade the alignment of the road shall be properly set out true to lines curves, slopes, grades and sections as shown in the plan or as directed by the Engineer-in-charge. The contractors shall provide all labors and materials such as lime, string, pegs, nails, bamboos, stones, mortar, concrete etc. required for setting out, establishing temporary & permanent bench marks, centre line stone & other marks and giving profiles, alignments and other marks, as longer they are required for the marks and long as opinion of the Engineer-in-charge.

**SPREADING AND COMPACTION:**

The graded granular materials shall be spread on the prepared sub-grade/blanket layer with the help of a motor graders of adequate capacity, its blade having hydraulic controls suitable for initial adjustment and for maintaining the required slops and grade during the operation or other approved means. The thickness of loose layer shall be so regulated that the maximum thickness of the layer after consolidation of required thickness, shown on the drawing or as directed by the Engineer-in-charge. Successive layers of W.M.M. shall not be placed until the layers under construction have been thoroughly compacted to the requirements set down hereunder and accepted by the Engineer-in-charge.

The operation of laying the successive layers of graded granular materials shall have to be suitable synchronized with the consolidation work. Moisture content of the loose material shall be checked in accordance with IS:2720 (Part-2) and suitable adjusted by sprinkling additional water from a truck mounted or trailer mounted water tank and suitable for applying water uniformly and at a control quantities to variable width of surface or other approved means so that at the time of compaction it is from 1 percent above to 2 percent below the optimum moisture content corresponding to IS:2720 (Part-B). While adding water, due allowance shall be made for evaporations losses. After water has been added the material shall be processed by mechanical or other approved means if so directed by the Engineer-in-charge until the layer is uniformly wet.

Immediately thereafter rolling shall be started with vibratory roller of 80 to 100 KN static weights with plain drum or heavy pneumatic tyre roller of minimum 200 to 300 KN weight having a minimum tyre pressure of 0.70 MN/m<sup>2</sup> or other approved plant. Rolling shall commence at the lower edges and proceed towards the upper edge longitudinally for

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portion having unidirectional cross fall and on super elevation and shall commence at the edge and progress towards the centre of portions having cross fall on both sides.

Each pass of the roller shall uniformly overlap not less than one third of the track made in the proceedings 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. The speed of roller shall not exceed 5 KM per hour.

Rolling shall be continued till the density achieved is at least 98% of the maximum dry density for the material determined as per IS:2720 (Part-8). The surface of any layer of graded granular materials on completion of compaction shall be well closed free from movement under compaction plant 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 compacted.

#### **FINISHING OPERATIONS:**

The sub-base shall be finished conformity with the alignments, levels, cross sections and dimensions shown on the plans or as directed by the Engineer-in-charge. Finishing operations shall include the work of shaping and dressing the sub-base/shoulders and the side slopes to conform to the cross section.

When earthwork operations have been substantially completed, the road way are shall be cleared of all debris and ugly scraps in the construction area, responsible for objectionable appearance shall be eliminated. The defective portion shall be removed and re-constructed as directed by the Engineer-in-charge.

The surface finish of construction shall conform to the requirements as per general technical specification for Quality control on works and materials attached herewith ( As per MORT & H clause No.902 section 900).

#### **2) ARRANGEMENT FOR TRAFFIC:**

M.O.R.T. & H. specification clause no. 112 shall be followed.

#### **3) QUALITY CONTROL OF WORK:**

C.B.R. tests on materials to be used in the sub-base shall be carried out as and when required by the Engineer-in-charge. All testing charges shall be borne by the contractor.

Control on the quality of materials and works shall be exercised by the Engineer-in-charge in accordance with this specifications and general technical specifications for quality control on the works and materials attached herewith. The Engineer-in-charge shall have the right to modify the frequencies of testing according to the needs.( As per M.O.R.T. & H. clause no.900 ).

#### **4) MODE OF MESUREMENT AND PAYMENT:**

The work of providing, spreading & compacting the graded granular materials shall be measured as compacted and finished work in position in cubic meters. The finished and compacted thickness to be paid on volume basis shall be computed in the following manner. **Levels shall be taken before and after construction at a grid of points 10 or 30m centre to centre longitudinally in straight but 5 meters at curves. Normally on two lane roads, the levels shall be taken at four position transversely at 0.75 and 2.75meters from either edge of the carriage way or as directed by the Engineer-in-charge** and on single lane roads these shall be taken at two positions transversely being at 1.25m from the either edge of the carriage way or as directed by the Engineer-in-charge.

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The measurement may be taken at closer intervals also if so desired by the Engineer-in-charge.

The average thickness of the layer of granular material in any area shall be the arithmetical mean of the difference of levels before and after construction at all the grid points falling in that area, provides that thickness of finished work shall be limited to those shown on the drawings or approved by the Engineer-in-charge in writing.

The contractor shall sign day to day leveling work and also original cross section, longitudinal section in token of his acceptance etc. The working sections both longitudinal and cross of the sub-grade shall be taken by the Engineer-in-charge before the work is started. The contractor or his authorized representative shall attend day to day leveling work and sign with date the field book daily in token of this acceptance.

If there is any dis-agreement the contractor shall inform of it in writing to the officer concerned with specific reference to the sanctions before starting further work. Once the work is started no cognizance of any complaint taken, merely not signing of the level book shall not be deemed as dis-agreement. The contractor shall maintain the finished work to proper formation and grade till this item is finally measured and accepted by department. The measurement shall be taken on compacted work.

The contract unit rate for the work of providing, Laying, & compacting the graded granular materials for sub-base, shall be payment in full for carrying out the required operations including full compensation for :

- i) Cost of arrangement of land as a source of supply of granular material of required quality for construction.
- ii) Setting out
- iii) Compacting ground surrounding embankment prepared surface, sub-grade except where removal & replacement of unsuitable material or loosening and re compacting is involved.
- iv) Scarifying or cutting continuous horizontal benches 300mm wide on side slope of existing embankment and sub-grade as applicable.
- v) Cost of watering.
- vi) Spreading in layers, bringing to the appropriate moisture content and compacting to specifications requirement.
- vii) Shaping & dressing the top and slope.
- viii) Transporting the material to embankment & sub-grade side with all lead and lift.
- ix) All materials, labours, tools, equipment and incidental necessary to complete the work to the specifications.
- x) Carrying out required tests for quality control.
- xi) Making arrangement for traffic.
- xii) Furnishing of all material to be incorporated in the work including all royalty, fee, rent & all lead & lift.
- xiii) Dewatering.

**The contract unit rate shall be for a unit of one cubic meter of finished compacted work in position at site of work.**

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**ITEM NO. 04 OF SCHEDULE B1:**

**Construction of dry lean cement concrete Sub- base over a prepared sub-grade with coarse and fine aggregate conforming to IS: 383, the size of coarse aggregate not exceeding 25 mm, aggregate cement ratio not to exceed 15:1, aggregate gradation after blending to be as per table 600-1, cement content not to be less than 150 kg/cum, optimum moisture content to be determined during trial length construction, concrete strength not to be less than 10 Mpa at 7 days, mixed in a batching plant, transported to site, laid with a paver with electronic sensor, compacting with 8-10 tones vibratory roller, finishing and curing.**

**Materials :**

Water, Cement, Coarse Aggregate, Fine Aggregate, Fly ash Fiber shall be to the specifications as MATERIAL above.

**Proportioning the Material for the Mix:**

"Various Materials to be used in fly ash concrete shall be as per the design mix to give the 28 day compressive strength equal to that of plane concrete of the Proportion defined as 1:3:6.with use of Minimum cement as 150 Kg / cum and max cement contents shall be aggregate and cement ratio shall be 15:1. Any increase in cement content than specified above cost there of shall be borne by the agency."

Permissible replacement of cement by fly ash to be within limit of 15% and with respect to sand up to 10%.

Aggregate Proportion for Dry Lean Concrete.

<b>IS Sieve [mm]</b>	<b>Cumulative percent passing by weight of total aggregate.</b>
26.5	100
19	80 - 100
9.5	55 - 75
4.75	35 - 60
0.6	10 - 35
0.075	0 - 8

**Moisture Contents.**

The right amount of moisture content for lean concrete in the work shall be decided so as to ensure full compaction under rolling and shall be assessed at the time of rolling the trial length. Too little moisture shall lead to inadequate compaction ,low in situ strength and open textured surface whereas excess moisture than needed shall cause heaving of concrete before the wheels and picking up on the wheels of the roller.

**Cement content and Concrete Strength.**

Average compressive strength of each consecutive group of 5 cubes made in accordance to MORTH CL. 903.5.1.1 shall not be less than 10 MPa at 7 day and minimum compressive

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strength of any individual cube shall not be less than 7 MPa at 7 day. The design mix complying the above requirements shall be got approved from the EIC and demonstrated in the trial length construction.

### **Construction.**

#### **1 : General :**

It shall be in conformity to the clause No. 601.5.1 of MORTH specification.

#### **2 : Batching and Mixing :**

Instructions contained per para 601.5.2 shall be guiding factor. . Batching plant shall be capable to produce concrete as per approved mix design by weight, each type of material shall be weighed separately in accordance to clause 602.9.3.2.

#### **3 : Transporting Concrete:**

The provisions laid down under MORTH Cl. 601.5.3. shall be followed.

#### **4 : Placing :**

"The concrete shall be laid / placed after transporting by a approved type of paver by EIC. The equipment shall be capable of laying the material in one layer in, required width in one go only , in an even manner without segregation, so that after compaction the total width is specified. The paving machine shall have high amplitude temping bars to give good initial compaction to sub base. In general provisions of Cl.601.5.4 of MORTH specifications shall be applicable."

#### **5 : Compaction:**

Compaction in full width of laid concrete shall be carried out by smooth wheel vibratory roller initially without vibration to bed the lean concrete down and again final pass without vibration to remove roller marks & to smoothen the surface, of minimum static weight 80 to 100 KN consider most suitable for rolling drying concrete , as per provisions of CL. 601.5.5. of MORTH specifications to achieve MINIMUM dry density at 97 % of that achieved at trial length construction. The density within 0.50 met. Strip at edges shall not be less than 95% that achieved during trial run construction.

The number of passes required to obtain the maximum compaction shall depends on the thickness of lean concrete ,150 mm in this case, compatibility of the mix and the weight and type of roller., and the same as well as the total requirement of the roller shall be determined during the trial run construction by measuring the in-situ density of concrete.

Double drum smooth wheeled vibratory roller shall be used to achieve the full compaction after initial compaction of concrete.

Final lean concrete surface on completion of compaction and immediately before over laying , shall be well closed, free from movements under the roller and free of ridges, low spots, cracks, loose materials, pot holes ruts and other defects and the same shall be rectified by spreading aggregate mix 10 mm and below and compacted to give required look ,line and level to finished lean concrete. It is necessary to check the levels of the rolled surface for compliance.

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**6 : Joints :**

Construction joints shall be provided at the end of day's work by a vertically cut joint , unless a vertical forms are used. Edge of compacted material shall be cut to a vertical face where correct thickness of the properly compacted material has been obtained. Care shall be taken to see that the joints are selected at location where vertical joint of the concrete pavement is not likely to fall. Transverse and longitudinal joints in the pavement and the sub base shall be staggered so that they are not coincident vertically and at least 1met. & 0.30mt. apart respectively.

**7 : Curing :**

As soon as the lean concrete surface is completed ,curing shall commence. One of the following two methods can be adopted:

a) The initial curing shall be done by spraying with liquid curing compound. The curing compound shall be white pigmented or transparent type with water retention index of 90 per cent when tested in accordance with BS 7542. Curing compound shall be sprayed immediately after rolling is complete. As soon as the curing compound has lost its tackiness, the surface shall be covered with wet Hessian for three days.

b) Curing shall be done by covering the surface by gunny bags/ Hessian cloth, which shall be kept continuously moist for 7 days by sprinkling water.

**8 : Trial Mixes:**

The Contractor shall make trial mixes of dry lean concrete with moisture contents like 5.0, 5.5, 6.0, 6.5 and 7.0 per cent using cement content specified and the specified aggregate grading but without violating the requirement of aggregate-cement ratio specified in clause 601.3.1.

OMC and density shall be established by preparing cubes of concrete with varied moisture contents. Compaction of the mix shall be carried out in three layers with vibratory humor with a square or rectangular base as per cl.903.5.1.1 of MORTH specification. Compressive strength shall be determined by casting 6 cubes, at the moisture content finalized, and the strength on third and seven day shall be obtain upon satisfactory compressive strength is obtained the mix shall be approved by EIC.

**9 : Trial Length:**

The trial length shall be constructed at least 14 days in advance of the proposed date of commencement of work. At least 30 days prior to the construction of the trial length, the Contractor shall submit for the Engineer's approval a "Method Statement" giving detailed description of the proposed materials, plant, equipment, mix proportion and procedure for batching, mixing, laying, compaction and other construction procedures. The Engineer shall also approve the location and length of trial construction which shall be a minimum of 60 m length and for full width of the pavement. The trial length shall contain the construction of at least one transverse construction joint involving hardened concrete and freshly laid sub-base. The construction of trial length will be repeated till the Contractor proves his ability to satisfactorily construct the sub base.

MORTH cl.601.7.4 shall be followed for inspecting the bottom surface of the concrete laid for observation of the segregation. The trial length shall be outside the main work and the main work to be started after approval to the trial run length given in respect of materials

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mix proportion moisture content, mixing, laying, compaction plan, paver and the construction procedure shall not be change as approved by EIC

**10 :** In order to determine and demonstrate the optimum moisture content which results in the maximum dry density of the mix compacted by the rolling equipment and the minimum cement content that is necessary to achieve the strength stipulated in the drawing, trial mixes shall be prepared as per clause 601.6.

**11 :** After the construction of the trial length, the in-situ density of the freshly laid material shall be determined by sand replacement method with 20 cm dia density cone. Three density holes shall be made at locations equally spaced along a diagonal that bisects the trial length; average of these densities shall be determined. These main density holes shall not be made in the strip 50 cm from the edges. The average density obtained from the three samples collected shall be the reference density and is considered as 100 per cent. The field density of regular work will be compared with this reference density in accordance with Cl. 601.5.5.1 and 903.5.1.2. A few cores may be cut as per the instructions of the Engineer to check segregation or any other deficiency.

**12 :** Tolerances for Surface Regularity, Level, Thickness, Density and Strength :

The tolerances for surface regularity, level, thickness, density and strength shall conform to the requirements given in Clause 903.5. Control of quality of materials and works shall be exercised by the Engineer in accordance with Section 900.

**13 : Traffic :**

No heavy commercial vehicles like trucks and buses shall be permitted on the lean concrete sub-base after its construction. Light vehicles if unavoidable may, however, be allowed after 7 days of its construction with prior approval of the Engineer.

**14 : Rate :**

The contract unit rate payable for dry lean concrete sub-base shall be payment in full for carrying out the required operations including full compensation for all labour, materials and equipment , mixing, transport, placing, compacting, finishing, curing, testing and incidentals to complete the work as per specifications, all royalties, fees, storage and rents where necessary and all leads and lifts.

**15 : Measurements for Payment :**

The unit of measurement for dry lean concrete pavement shall be the cubic meter of concrete placed, based on the net plan areas for the specified thickness shown on the drawings or as directed by the Engineer.

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**ITEM NO.05 OF SCHEDULE B1:**

**Construction of un-reinforced, dowel jointed, plain cement concrete pavement over a prepared sub base with 53 grade cement @ 440 kg per cum, coarse and fine aggregate conforming to IS 383, maximum size of coarse aggregate not exceeding 25 mm, mixed in a batching and mixing plant as per approved mix design, transported to site, laid with a fixed form or slip form paver, spread, compacted and finished in a continuous operation including cost of contraction, expansion, construction and longitudinal joints, joint filler, separation membrane, sealant primer, joint sealant, debonding strip, dowel bar, tie rod, admixtures as approved, curing compound, finishing to lines and grades as per drawing and EIC.**

**Scope:**

The work shall consist of construction of unreinforced concrete, cement concrete pavement in accordance with the requirements of these specifications and in conformity with the lines, grades and cross sections shown on the drawings. The work shall include furnishing of all plant and equipment, materials and labor and performing all operations in connection with the work, as approved by the Engineer.

The design parameters, viz., thickness of pavement slab, grade of concrete, joint details etc. shall be as per Item descriptions.

**Working methodology:**

Work carried out as per Item description with use of materials and machinery as mentioned in item descriptions and details specifications.

**Cement Content :**

The cement content shall not be less than 400 kg per cum of concrete. The cement content shall however not exceed 450 kg per cum of concrete.

**Concrete Strength :**

While designing the mix in the laboratory, correlation between flexural and compressive strengths of concrete of concrete shall be established on the basis of at least thirty tests on samples. However, quality control in the field shall be exercised on the basis of flexural strength. It may, however, be ensured that the materials and mix proportions remain substantially unaltered during the daily concrete production. The water content shall be the minimum required to provide the agreed workability for full compaction of the concrete to the required density as determined by the trial mixes or other means approved by the engineer and maximum free water cement ratio shall be 0.50.

The ratio between the 7 and 28 day strengths shall be established for the mix to be used for the pavement slab in advance, by testing pairs of beams and cubes at each stage on at least six batches of trial mix. The average strength of the 7 day cured specimens shall be divided by the average strength of the 28 day specimens for each batch and the ratio 'R' shall be determined. The ratio 'R' shall be expressed to three decimal places.

If during the construction of the trial length or during normal working, the average value of any four consecutive 7 day test results falls below the required 7 day strength as desired

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from the value of 'R' then the cement content of the concrete shall without extra payment be increased by weight as directed and agreed by the engineer. The increased cement content shall be maintained at least until the four corresponding 28 day strengths have been assessed for its conformity with the requirements as per clause 602.3.1. Whenever the cement content is increased, the concrete mix shall be adjusted to maintain the required workability. No extra payment shall be made for any increase of quantity of cement as it is essential that concrete of required strength is to be produced by agency.

#### **Workability :**

The workability of the concrete at the point of placing shall be adequate for the concrete to be fully compacted and finished without undue flow. The optimum workability for the mix to suit the paving plant being used shall be determined by the contractor and approved by the engineer. The control of workability in the field shall be exercised by the slump test as per IS : 1199.

The workability requirement at the batching plant and paving site shall be established by slumps tests carried during trial paving. These requirements shall be established from season to season and also when the lead from batching plant site to the paving site changes. The workability shall be established for the type of paving equipment available. A slump value in the range of 30 + 15 mm is reasonable for paving works but this may be modified depending upon the site requirement and got approved by the engineer. These tests shall be carried out on every truck/dumper at plant site and paving site initially when the work commence but subsequently the frequency can be reduced to alternate trucks or as per the instructions of the engineer.

#### **Design mix :**

The contractor shall carry out laboratory trials of design mixes with the materials from the approved sources to be used. Trial mixes shall be made in presence of the engineer or his representative and the design mix shall be subject to the approval of the engineer. They shall be repeated if necessary until the proportions that will produce a concrete which complies in all respects with this specifications and conforms to the requirement of the design/drawings have been determined.

The proportions determined as a result of the laboratory trial mixes may be adjusted if necessary during the construction of the trial length. Thereafter, neither the materials nor the mix proportions shall not be varied in any way except with the written approval of the engineer.

#### **Separation Membrane :**

A separation membrane shall be impermeable plastic sheathing 250 micron thick used between the concrete slab and the sub base. Separation membrane shall be impermeable plastic sheathing 250 microns thick laid flat without creases. Before placing the separation membrane, the sub-base shall be swept clean of all the extraneous materials, the same shall be at least 300 mm and any damaged sheathing shall be replaced at the contractor's expense. The separation membrane may be nailed to the lower layer with concrete nails.

#### **Joints :**

The location and type of joints shall be as shown in the drawing. Joints shall be constructed depending upon their functional requirement as detailed in the following paragraphs. The location of the joints should be transferred accurately at the site. It should be ensured that

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the full required depth it made from edge to edge of the pavement. Transverse and longitudinal joints in the pavement and sub-base shall be staggered so that they are not coincident vertically and are at least 1 meter apart.

#### **Transverse Joints :**

Transverse joints shall be contraction and expansion joints constructed at the spacing described in the drawings. Transverse joints shall be straight within the following tolerance along the intended line of joints which is the straight line transverse to the longitudinal axis of the carriageway at the position proposed by the contractor and agreed to by the engineer, except at road junctions or roundabouts where the position shall be as described in the drawings.

Transverse construction joints shall be placed whenever concreting is completed after a day's work or is suspended for more than 30 minutes. These joints shall be provided at the regular location of contraction joints using dowel bar. The joint shall be made butt type. At all construction joints, steel bulk heads shall be used to retain the concrete while the surface is finished. The surface of the concrete laid subsequently shall conform to the grade and cross sections of the previously laid pavement.

Deviations of the filler board in the case of expansion joints from the intended line of the joint shall not be greater than + 10 mm

The best fit straight line through the joint grooves as constructed shall be not more than 25 mm from the intended line of the joint.

Deviations of the joint groove from the best fit straight line of the joint shall not be greater than 10 mm.

Transverse joints on each side of the longitudinal joint shall be in line with each other and of the same type and width. Transverse joints shall have a sealing groove which shall be sealed in compliance with MORTH clause 602.11.

#### **Contraction Joints :**

Contraction joints shall consist of a mechanical sawn joint groove, of size as stipulated in the drawings and dowel bars complying with MORTH clause 602.6.5 and as detailed in the drawings.

#### **Expansion Joints :**

The expansion joint shall consist of a joint filler board complying with clause 602.2.7 and dowel bars complying with clause 602.6.5 and as detailed in the drawings. The filler board shall be positioned vertically with the prefabricated joint assemblies along the line of the joint within the tolerances given in clause 602.6.2.1 and at such depth below the surface as will not impede the passage of the finishing straight edges or oscillating beams of the paving machines. The adjacent slabs shall be completely separated from each other by providing joint filler board. Space around the dowel bars, between the sub-base and the filler board shall be packed with a suitable compressible material to block the flow of cement slurry.

#### **Transverse construction joint:**

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Transverse construction joints shall be placed whenever concreting is completed after a day's work or is suspended for more than 30 minutes. These joints shall be provided at the regular location of contraction joints using dowel bar. The joint shall be made butt type. At all construction joints, steel bulk heads shall be used to retain the concrete while the surface is finished. The surface of the concrete laid subsequently shall conform to the grade and cross sections for the previously laid pavement.

Weather and Seasonal Limitations during construction of Pavement slab.

**Concreting during monsoon months:**

When concrete is being placed during monsoon months and when it may be expected to rain, sufficient supply to tarpaulin or other water proof cloth shall be provided along the line of the work. Any time when it rains, all freshly laid concrete which had not been covered for curing purposes shall be adequately protected. Any concrete damaged by rain shall be removed and replaced. If the damage is limited to texture, it shall be retextured in accordance with the directives of the engineer.

**Concreting in hot weather:**

No concreting shall be done when the concrete temperature is above 30 degree centigrade. Besides, in adverse conditions like high temperature, low relative humidity, excessive wind velocity, imminence of rains etc. if so desired by the engineer, tents on mobile trusses may be provided over the freshly laid concrete for a minimum period of 3 hrs as directed by the engineer. The temperature of the concrete mix on reaching the paving site shall not be more than 30°C. To bring down the temperature, if necessary, chilled water or ice flakes should be made use of.

**Side forms, Rails and Guide wires:**

**(A) Side forms and rails:**

All side forms shall be of mild steel of depth equal to the thickness of pavement or slightly less to accommodate the surface regularity of the sub-base. The forms can be placed on series of steel packing plates or shims to take care of irregularity of sub-base. They shall be sufficiently robust and rigid to support the weight and pressure caused by a paving equipment. Side forms for use with wheeled paving machines shall incorporate metal rails firmly fixed at a constant height below the top of the forms. The forms and rails shall be firmly secured in position by not less than 3 stakes/pins per each 3 m length so as to prevent movement in any direction. Forms and rails shall be straight within a tolerance of 3 mm in 3 m and when in place shall not settle in excess of 1.5mm in 3 m while paving is being done. Forms shall be cleaned and oiled immediately before each use. The forms shall be bedded on a continuous bed of low moisture content lean cement mortar or concrete and set to the line and levels shown on the drawings within tolerance + 10 mm and + 3 mm respectively. The step between adjacent forms of more than 3 mm. The forms shall be got inspected from the engineer for his approval before 12 hrs on the day before the construction of the slab and shall not be removed until at least 12 hrs afterwards.

At all times sufficient forms shall be used and set to the required alignment for at least 200 met. Length of pavement immediately in advance of paving operation or the anticipated length of pavement to be laid within next 24 hrs. whichever is more.

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**(B) Use of Guide wires:**

Where slip form paving is proposed, a guide wire shall be provided along both sides of the slab. Each guide wire shall be at a constant height above and parallel to the required edges of the slab as described in the contract / drawing within a vertical tolerance of + 3 mm. Additionally, one of the wires shall be kept at a constant horizontal distance from the required edge of the pavement as indicated in the contract / drawing within a lateral tolerance of + 10 mm.

The guide wires shall be supported on stakes not more than 8 m apart by connectors capable of fine horizontal and vertical adjustment. The guide wire shall be tensioned on the stakes so that a 500 gram weight shall produce a deflection of not more than 20 mm when suspended at the midpoint between any pair of stakes. The ends of the guide wires shall be anchored to fixing point or winch and not on the stakes.

The stakes shall be positioned and the connectors maintained at their correct height and alignment from 12 hrs on the day before concreting takes place until 12 hrs after finishing of the concrete. The guide wire shall be erected and tensioned on the connectors at any section for at least 2 hrs before concreting that section.

The contractor shall submit to the engineer for his approval of line and level, the stakes and connectors which are ready for use in the length of road to be constructed by 12 hrs on the working day before the day of construction of slab. Any deficiencies noted by the engineer shall be rectified by the contractor who shall then re-apply for approval of the affected stakes. Work shall not proceed until the engineer has given his approval. It shall be ensured that the stakes and guide wires are not affected by the construction equipment when concreting is in progress.

**Construction:****General:**

A systems approach may be adopted for construction of the pavement, and the method statement for carrying out the work, detailing all the activities including indication of time-cycle, equipment, personnel etc. shall be got approved from the engineer before the commencement of the work. The above shall include the type, capacity and make of the batching and mixing plant besides the hauling arrangement and paving equipment. The capacity of paving equipment, batching plant as well as all the ancillary equipment shall be adequate for a paving rate of at least 300 m in one day.

**Batching and mixing:**

Batching and mixing of the concrete shall be done at a central batching and mixing plant with automatic control, located at a suitable place which takes into account sufficient space for stockpiling of cement, aggregates and stationary water tanks. This shall be however, situated at an approved distance, duly considering the properties of the mix and the transporting arrangements available with the contractor.

**Equipment for proportioning of materials and paving:**

Proportioning of materials shall be done in the batching plant by weight, each type of material being weighed separately. The cement from the bulk stock may be weighed separately from the aggregates and water shall be measured by volume. Wherever properly

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graded aggregate of uniform quality cannot be maintained as envisaged in the mix design, the grading of aggregates shall be controlled by appropriate blending techniques. The capacity of batching and mixing plant shall be at least 25 per cent higher than the proposed capacity of the laying / paving equipment.

### **Batching plant and equipment:**

#### **1) General:**

The batching plant shall include minimum four bins, weighing hoppers, and scales for the fine aggregate and for each size of coarse aggregate. If cement is used in bulk, a separate scale for cement shall be included. The weighing hoppers shall be properly sealed and vented to preclude dust during operation. Approved safety devices shall be provided and maintained for the protection of all personnel engaged in plant operation, inspection and testing. The batch plant shall be equipped with a suitable non-reset table batch counter which will correctly indicate the number of batches proportioned.

#### **2) Bins and hoppers:**

Bins with minimum number of four adequate separate compartments shall be provided in the batching plant.

#### **3) Automatic weighing devices:**

Batching plant shall be equipped to proportion aggregates and bulk cement by means of automatic weighing devices using load cells.

#### **4) Mixers:**

Mixers shall be pan type, reversible type or any other mixer capable of combining the aggregates, cement and water into a thoroughly mixed and uniform mass within the specific mixing period and of discharging the mixture, without segregation. Each stationary mixer shall be equipped with an approved timing device which will automatically lock the discharge lever when the drum has been charged and release it at the end of the mixing period. The device shall be equipped with a bell or other suitable warning device adjusted to give a clearly audible signal each time the lock is released. In case of failure of the timing device, the mixer may be used for the balance of the day while it is being repaired, provided that each batch is mixed 90 seconds or as per the manufacturer's recommendation. The mixer shall be equipped with a suitable non-reset table batch counter which shall correctly indicate the number of batches mixed.

The mixers shall be cleaned at suitable intervals. The pickup and throw-over blades in the drum or drums shall be repaired or replaced when they are worn down 20 mm or more. The contractor shall (1) have available at the job site a copy of the manufacturer's design, showing dimensions and arrangements of blades in reference to original height and depth, or (2) provide permanent marks on blade to shown points of 20 mm wear from new conditions. Drilled holes of 5 mm diameter near each end and t midpoint of each blade are recommended. Batching plant shall be calibrated in the beginning and thereafter at suitable interval not exceeding 1 month.

#### **5) Control Cabin:**

An air conditioned centralized control cabin shall be provided for automatic operation of the equipment.

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**Paving Equipment:**

The concrete shall be placed with an approved slip from paver with independent units designed to (i) spread, (ii) consolidate, screed and float-finish (iii) texture and cure the freshly placed concrete in one complete pass of the machine in such a manner that a minimum of hand finishing will be necessary and so as to provide a dense and homogeneous pavement in conformity with the plans and specifications. The paver shall be equipped with electronic controls to control / sensor line and grade from either or both sides of the machine.

Vibrators shall operate at a frequency of 8300 to 9600 impulses per minute under load at a maximum spacing of 60 cm. The variable vibration setting shall be provided in the machine.

**Concrete Saw:**

The contractor shall provide adequate number of concrete saws with sufficient number of diamond-edge saw blades. The saw machine shall be either electric or petrol/diesel driven type. A water tank with flexible hoses and pump shall be made available in this activity on priority basis. The contractor shall have at least one standby saw in good working condition. The concreting work shall not commence if the saws are not in working condition.

**Hauling and placing of concrete:**

Freshly mixed concrete from the central batching and mixing plant shall be transported to the paver site by means of trucks/tippers of sufficient capacity and approved design in sufficient numbers to ensure a constant supply of concrete. Covers shall be used for protection of concrete against the weather. The trucks/tippers shall be capable of maintaining the mixed concrete in a homogeneous state and discharging the same without segregation and loss of cement slurry. The feeding to the paver is to be regulated in such a way that the paving is done in an uninterrupted manner with a uniform speed throughout the days work.

**Placing of concrete:**

Concrete mixed in central mixing plant shall be transported to the site without delay and the concrete which, in the opinion of the engineer, has been mixed too long before laying will be rejected and shall be removed from the site. The total time taken from the addition of the water to the mix, until the completion of the surface finishing and texturing shall not exceed 120 minutes when concrete temperature is less than 25°C and 90 minutes when the concrete temperature is between 25°C to 30°C. Trucks/tippers delivering concrete shall not run on plastic sheeting nor shall they run on completed slabs until after 28 days of placing the concrete. The paver shall be capable of paving the carriageway as shown in the drawings, in a single pass and lift.

Where fixed form pavers are to be used, forms shall be fixed in advance as per MORT&H clause 602.8 of the specifications. Before any paving is done, the site shall be shown to the engineer, in order to verify the arrangement for paving besides placing of dowels, tie-bars etc. as per the relevant clauses of this specification. The mixing and placing of concrete shall progress only at such a rate as to permit proper finishing, protecting and curing of the pavement.

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In all cases, the temperature of the concrete shall be measured at the point of discharge from the delivery vehicle.

The addition of water to the surface of the concrete to facilitate the finishing operations will not be permitted except with the approval of the engineer when it shall be applied as a mist by means of approved equipment.

If considered necessary by the engineer, the paving machines shall be provided with approved covers to protect the surface of the slab under construction from direct sunlight and rain or hot wind.

While the concrete stills plastic, its surface shall be brush textured in compliance with cl. 602.9.8 and the surface and edges of the slab cured by the application of a sprayed liquid curing membrane in compliance with clause 602.9.9. After the surface texturing, but before the curing compound is applied, the concrete slab shall be marked with the chain age at every 100 m interval.

As soon as the side forms are removed, edges of the slabs shall be corrected wherever irregularities have occurred by using fine concrete composed of one part of cement to 3 parts of fine chips and fine aggregate under the supervision of the engineer.

If the requirement of clause 902.4 for surface regularity fails to be achieved on two consecutive working days, then normal working shall cease until the cause of the excessive irregularity has been identified and remedied.

#### **CONSTRUCTION BY SLIP FORM PAVER:**

The slip form paving train shall consist of power machine which spreads, compacts and finishes the concrete in a continuous operation. The slip form paving machine shall compact the concrete by internal vibration and shape it between the side forms with either a conforming plate or by vibrating and oscillating finishing beams. The concrete shall be deposited without segregation in front of slip form paver across the whole width and to a height which at all times is in excess of the required surcharge. The differential surcharge by means of the strike off plate or a screw auger device extending across the whole width of the slab. The equipment for striking off the concrete shall be capable of being rapidly adjusted for changes of the average and differential surcharge necessitated by change in slab thickness or cross fall.

The level of the conforming plate and finishing beams shall be controlled automatically from the guide wires installed as per clause 602.8 by sensors attached at the four corners of the slip form paving machine. The alignment of the paver shall be controlled automatically from the guide wire by at least one set of sensors attached to the paver. The alignment and level of ancillary machines for finishing, texturing and curing of the concrete shall be automatically controlled relative to the guide wire or to the surface and edge of the slab.

#### **Surface texture:**

After the final regulation of the slab and before the application of the curing membrane, the surface of concrete slab shall be brush-textured in a direction at right angles to the longitudinal axis of the carriageway.

The brushed surface texture shall be applied evenly across the slab in one direction by the use of a wire brush not less than 450 mm wide but longer brushes are preferred. The brush

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shall be made of 32 gauge tape wires grouped together in tufts spaced at 10 mm centres. The tufts shall contain an average of 14 wires and initially be 100mm long. The brush shall have two rows of tufts. The rows shall be 20mm apart and the tufts in one row shall be opposite the centre of the gap between tufts in the other row. The brush shall be replaced when the shortest tuft wears down to 90 mm long.

"The texture depth shall be determined by the sand patch test as described in clause 602.12. This test shall be performed at least once for each day's paving and wherever the engineer considers it necessary at times after construction as under:

Five individual measurements of the texture depth shall be taken at least 2 m apart anywhere along a diagonal line across a lane width between points 50 m apart along the pavement. No measurement shall be taken within 300 mm of the longitudinal edges of a concrete slab constructed in one pass."

Texture depths shall not be less than the minimum required when measurements are taken as given in Table 600-2 not greater than a maximum average of 1.25 mm.

#### **Curing:**

Immediately after the surface texturing, the surface and sides of the slab shall be cured by the application of approved resin-based aluminized reflective curing which hardens into an impervious film or membrane with the help of a mechanical sprayer.

Curing compounds shall contain sufficient flake aluminium in finely divided dispersion to produce a complete coverage of the sprayed surface with a metallic finish. The compound shall become stable and impervious to evaporation of water from the surface of the concrete within 60 minutes of application and shall be of approved type. The curing compounds shall have a water retention efficiency index of 90 per cent in accordance with BS specification no.7542.

In addition to spraying of curing compound, fresh concrete surface shall be protected for at least 3 hours by covering with tents as per MORTH cl.602.7.2. during adverse weather conditions . After 3 hours the covering shall be with moist Hessian and the same shall be then kept moist for minimum period of 14 hours, after which Hessian can be removed with approval of Engineer.

All damaged / torn Hessian shall be removed and replaced by new Hessian on regular basis.

Contractor shall be liable at his expense to replace any concrete damaged as a result of incomplete curing or cracked concrete or line of crack except than at joint.

#### **Trial length:**

As described in item no. 5

#### **Approval and acceptance:**

Approval of materials, plant, equipment and construction methods shall be given when a trial length complies with the specification. The contractor shall not proceed with normal working until the trial length has been approved and any earlier defective trial lengths have been removed unless that can be remedied to the satisfaction of the Engineer. If the Engineer does not notify the contractor of any deficiencies in any trial length within 10

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days after the completion of that trial length, the Contractor may assume that the trial length and the materials, plant, equipment and construction methods adopted are acceptable.

When approval has been given, the materials, plant equipment and construction methods shall not thereafter be changed, except for normal adjustments and maintenance of plant, without the approval of the Engineer. Any changes in materials, plant, equipment and construction methods shall entitle the Engineer to require the Contractor to lay a further trial length as described in this clause to demonstrate that the changes will not adversely affect the permanent works.

#### **Measurements for Payment:**

Cement concrete pavement shall be measured as finished work in square meters with specified thickness. The volume to be paid for will be calculated on the basis of thickness and plans shown on the project drawings and adjusted for the deficiency in thickness. No additional payment shall be made for extra thickness of the slab. The full payment will be made to this item after 28 days strength of the concrete is found to be satisfactory.

The unit for measurement for concrete pavement shall be the cubic meter of concrete placed, based on the net plan areas for the specified thickness shown on the drawings or directed by engineer. The rate shall include all provisions of this specification and shall include the preparation of concrete, providing form work for pavement as required, transport, placing, compacting, finishing, and curing including testing and submission of test certificates and records. No deduction shall be made in measurement for openings provided that the area of each is less than 0.5 sq.m. The unit rate as entered in the Bill of Quantities.

#### **ITEM NO.6 OF SCHEDULE B1:**

**Road marking with hot applied thermoplastic paints with reflectorizing glass beads on bitumen surface providing and laying a hot applied thermoplastic compound 2.5 mm thick including reflectorizing glass beads @ 250gms per sqm area, thickness of 2.5mm is excluding of surface applied glass beds as per IRC:35-2015. The finished surface to be level, uniform and free from streaks and holes. zebra patta /bump patta lane/center line/ edge line/cut patta. The white color marking should provide luminancecoefficient on cement road shall be min 130 mcd/m<sup>2</sup>/lux and Asphalt road shall be min 100 mcd/m<sup>2</sup>/lux during the service life during the day time. The marking should meet the performance criteria for night time reflectivity, wet reflectivity and skid resistance as mentioned in the section-15 of IRC 35-2015. Warranty for the Retro reflectivity should be two years.**

#### **ROAD MARKINGS**

##### **General**

The colour, width and layout of road markings shall be in accordance with the Code of Practice for road markings with paints, IRC: 35, and as specified in the drawings or as directed by the Engineer.

##### **Materials**

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Road markings shall be of ordinary road marking paint, hot applied thermoplastic compound, or reflectorised paint as specified in the item and the material shall meet the requirements as specified below.

### **Ordinary Road Marking Paint**

Ordinary paint used for road marking shall conform to Grade 1 as per IS : 164.

The road marking shall preferably be laid with appropriate road marking machinery.

Laying thickness of road marking paint shall be as specified by the Engineer.

### **Hot Applied thermoplastic Road Marking**

#### **General**

1. The work under this section consists of marking traffic stripes using a thermoplastic compound meeting the requirements specified herein.
2. The thermoplastic compound shall be screeded/extruded on to the pavement surface in a molten state by suitable machine capable of controlled preparation of laying with surface application of glass beads at a specific rate. Upon cooling to ambient pavement temperature, it shall produce an adherent pavement marking of specified thickness and width and capable of resisting deformation by traffic.
3. The colour of the compound shall be white or yellow (IS colour No, 356) as specified in the drawings or as directed by the Engineer.
4. Where the compound is to applied to cement concrete pavement, a sealing primer as recommended by the manufacturer, shall be applied to the pavement in advance of placing of the stripes to ensure proper bonding of the compound. On new concrete surface any laitance and/or curing compound shall be removed before the markings are applied.

#### **Thermoplastic Material**

**General:** The thermoplastic material shall be homogeneously composed of aggregate, pigment, resins and glass reflectorizing beads.

#### **Requirements**

1. **Composition:** The pigment beads, and aggregate shall be uniformly dispersed in the resin. The material shall be free from all skins, dirt and foreign objects and shall comply with requirements indicated in Table 800-3.

**TABLE 800-3. PROPORTIONS OF CONSTITUENTS OF MARKING MATERIAL  
(PERCENTAGE BY WEIGHT)**

<b>Component</b>	<b>White</b>	<b>Yellow</b>
Binder	18.0 min	18.0 min

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Glass beads	30-40	30-40
Titanium dioxide	10.0 min	---
Calcium carbonate and inert fillers	42.0 max	See
Yellow pigments	---	Note

Note: Amount of yellow pigment, calcium carbonate and inert fillers shall be at the option of the manufacturer, provided all other requirements of this specification are met.

2. Properties: The properties of thermoplastic material, when tested in accordance with ASTM D36 /BS-3262- (Part 1), shall be as below :

- (a) Luminance :  
 White : Daylight luminance at 45 degrees – 65 percent min. as per AASHTO M 249.  
 Yellow : Daylight luminance at 45 degrees – 45 percent min. as per AASHTO M 249.
- (b) Drying time :  
 When applied at a temperature specified by the manufacturer and to the required thickness, the material shall set to bear traffic in not more than 15 minutes.
- (c) Skd resistance  
 not less than 45 as per BS 6044.
- (d) Cracking resistance at low temperature :  
 The material shall show no cracks on application to concrete blocks.
- (e) Softening point  
 102.5 ± 9.5 degree c. as per ASTM D 36.
- (f) Flow resistance  
 Not more than 25 percent as per AASTHTO M 249.
- (g) Yellowness index (for white thermoplastic paint)  
 not more than 0.12 as per AASHTO M 249.

**(iii) Storage life:** The material shall meet the requirements of these specifications for a period of one year. The thermoplastic material must also melt uniformly with an evidence of skins or unmelted particles for the one year storage period. Any material not meeting the above requirements shall be replaced by the manufacturer/supplier/Contractor.

**(iv) Reflectorisation:** shall be achieved by incorporation of beads, the grading and other properties of the beads shall be as specified in Clause 803.4.3.

**(v) Marking:** Each container of the thermoplastic material shall be clearly and indelibly marked with the following information.

1. The name, trade mark or other means of identification of manufacturer
2. Batch number
3. Date of manufacture

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4. Colour (white or yellow)

5. Maximum application temperature and maximum safe heating temperature.

(vi) Sampling and testing - The thermoplastic material shall be sampled and tested in accordance with the appropriate ASTM / BS Method. The Contractor shall furnish to the employer a copy of certified test reports from the manufacturers of the material showing results of all tests specified herein and shall certify that the material meets all requirements of this Specification.

### **Reflectorising glass beads**

**General:** This Specification covers two types of glass beads to be used for the production of reflectorised pavement markings.

Type 1 beads are those which are a constituent of the basic thermoplastic compound vide Table 800-3 and Type 2 beads are those which are to be sprayed on the surface vide Clause 803.6.3.

The glass beads shall be transparent, colourless and free from milkiness, dark particles and excessive air inclusions.

These shall conform to the requirements spelt out in clause 803.4.3.3.

### **Specific requirements**

**A. Gradation:** The glass beads shall meet the gradation requirements for the two types as given in Table 800 - 4.

TABLE 800 – 4. GRADATION REQUIREMENTS FOR GLASS BEADS

Sieve size	Percent retained	
	Type 1	Type 2
1.18mm	0 to 3	---
850 micron	5 to 20	0 to 5
600 micron	---	5 to 20
425 micron	65 to 95	---
300 micron	---	30 to 75
180 micron	0 to 10	10 to 30
Below 180 micron	---	0 to 15

**B. Roundness:** The glass beads shall have a minimum of 70 percent true spheres.

**C. Refractive index:** The glass beads shall have a minimum reflective index of 1.50.

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**D. Free flowing properties:** The glass beads shall be free of hard lumps and clusters and shall dispense readily under any conditions suitable for paint striping. They shall pass the free flow-test.

Test methods: The specific requirements shall be tested with the following methods:

(i) Free-flow test : Spread 100 grams of beads evenly in a 100 mm diameter desiccator which is filled within 25 mm of the top of a desiccator plate with sulphuric acid water solution (specific gravity 1.10). Cover the desiccator and let it stand for 4 hours at 20 to 29 degree C. Remove sample from desiccator, transfer beads to a pan and inspect for lumps or clusters. Then pour beads into a clean, dry glass funnel having a 100mm stem and 6mm orifice. If necessary, initiate flow by lightly tapping the funnel. The glass spheres shall be essentially free of lumps and clusters and shall flow free through the funnel.

(ii) The requirements of gradation, roundness and reflective index of glass beads and the amount of glass beads in the compound shall be tested as per BS 6088 and BS 3262 (Part 1).

(iii) The Contractor shall furnish to the employer a copy of certified test reports from the manufacturer of glass beads obtained from a reputed laboratory showing results of all tests specified herein and shall certify that the material meets all requirements of this specification. However, if so required, these tests may be carried out as directed by the Engineer.

Application properties of thermoplastic material

The thermoplastic material shall readily get screeded/extruded at temperatures specified by the manufacturers for respective method of application to produce a line of specified thickness which shall be continuous and uniform in shape having clear and sharp edges.

The material upon heating to application temperatures, shall not exude fumes, which are toxic, obnoxious or injurious to persons or property.

### **Preparation**

(i). The material shall be melted in accordance with the manufacturer's instructions in a heater fitted with a mechanical stirrer to give a smooth consistency to the thermoplastic material to avoid local overheating. The temperature of the mass shall be within the range specified by the manufacturer, and shall on no account be allowed to exceed the maximum temperature stated by the manufacturer. The molten material should be used as expeditiously as possible and for thermoplastic material which has natural binders or is otherwise sensitive to prolonged heating, the material shall not be maintained in a molten condition for more than 4 hours.

(ii). After transfer to the laying equipment, the material shall be maintained within the temperature range specified by the manufacturer for achieving the desired consistency for laying.

### **Properties of finished road marking**

(a) The stripe shall not be slippery when wet.

(b) The marking shall not lift from the pavement in freezing weather.

(c) After application and proper drying, the stripe shall show no appreciable deformation or discolouration under traffic and under road temperatures up to 60 degree C.

(d) The marking shall not deteriorate by contact with sodium chloride, calcium chloride or oil drippings from traffic.

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(e) The stripe or marking shall maintain its original dimensions and position. Cold ductility of the material shall be such as to permit normal movement with the road surface without chopping or cracking.

(f) The colour of yellow marking shall conform to IS Colour No. 356 as given in IS : 164.

#### **Reflectorised Paint**

Reflectorised paint, if used, shall conform to the specification by the manufacturers and approved by the engineer. Reflectorising glass beads for reflectorising paints where used shall conform to the requirement of Clause 803.4.3.

#### **Application**

Marking shall be done by machine. For locations where painting cannot be done by machine, approved manual methods shall be used with prior approval of the engineer. The Contractor shall maintain control over traffic while painting operations are in progress so as to cause minimum inconvenience to traffic compatible with protecting the workmen.

The thermoplastic material shall be applied hot either by screeding or extrusion process. After transfer to the laying apparatus, the material shall be laid at a temperature within the range specified by the manufacturer for the particular method of laying being used. The paint shall be applied using a screed or extrusion machine.

The pavement temperature shall not be less than 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.

The material, when formed into traffic stripes, must be readily renewable by placing an overlay of new material directly over an old line of compatible material. Such new material shall so bond itself to the old line that no splitting or separation takes place.

Thermoplastic paint shall be applied in intermittent or continuous lines of uniform thickness of at least 2.5 mm unless specified otherwise. Where arrows or letters are to be provided, thermoplastic compound may be hand-sprayed, In addition to the beads included in the material, a further quantity of glass beads of Type 2, conforming to the above noted specification shall be sprayed uniformly into a mono-layer on to the hot paint line in quick succession of the paint spraying operation. The glass beads shall be applied at the rate of 250 grams per square metre area.

The minimum thickness specified is exclusive of surface applied glass beads. The method of thickness measurement shall be in accordance with Appendices B and C of BS- 3262 (Part 3).

The finished lines shall be free from ruggedness on sides and ends and be parallel to the general alignment of the carriageway. The upper surface of the lines shall be level, uniform and free from streaks.

#### **Measurements for payment**

The painted markings shall be measured in sq. metres of actual area marked (excluding the gaps, if any).

In respect of markings like directional arrows and lettering, etc.,

**the measurement and payment shall be by Sq. Mtr. basis.**

#### **Rate -**

The contract unit rate for road markings shall be payment in full compensation for furnishing all labour, materials, tools, equipment, including all incidental costs necessary for carrying out the work at the site conforming to these specifications complete as per the approved drawing (s) or as directed by the Engineer and all other incidental costs necessary to complete the work to these specifications.

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**ITEM NO. 7 OF SCHEDULE B1:**

**Supplying and fixing cat eye (Stimsonite) made out from Acrilo beaultile sterine injection high compressed molding with reflector made of MMC (prismatic type of size 12cm x 6cm x 2.5cm) provided with bituminous adhesive 100g. with each unit for fixing. (High Intensity grade)**

As Directed By Engineer In charge.

**ITEM NO.01 OF SCHEDULE B2:**

**Excavation for foundation upto 1.5m depth including sorting out and stacking of useful materials and disposing off the excavated stuff directed by Engineer in charge from the end of the cutting with all required lead and lift within the estate.**

**1. SCOPE :**

This specification covers the general requirements of earthwork in excavation in different materials, site grading, filling in areas as shown in drawing, filling back around foundations and in plinths, conveyance and disposal of surplus soils or stacking them properly as shown on the drawings and as directed by the Engineer and all operations covered within the intent and purpose of this specification.

The excavation shall be carried out per C1-1 Mode of measurement and payment. The payment for this item shall be made at the unit contract rate per cubic meter for the quantity excavated, limited to the dimension shown in the drawings or as directed by the Engineer in charge as specified in I S 1200 Part-1 of 1974.

**2. APPLICABLE CODES:**

The following Indian Standard Codes, unless otherwise specified herein, shall be applicable. In all cases, the latest revision of the codes shall be referred to.

1. IS: 1200 - Method of measurement of building and Civil engineering works.
  - (Part 1) Part 1 Earthwork
  - (Part 27) Part 27 Earthwork done by mechanical Appliances.
2. IS : 3764-1992 - Excavation work-code of safety
3. IS : 2720 - Methods of test for soils
  - (Part 1)-1973 - Part 1 Preparation of dry soil samples for various tests.
  - (Part 2)-1986 - Part 2 Determination of water content
  - (Part 4) - Part 4 Grain size analysis
  - (Part 5) -Part 5 Determination of liquid and plastic Limit
  - (Part 7) - Part 7 Determination of water content dry density relation using light compaction.
  - (Part 9) - Part 9 Determination of dry density moisture content relation by constant Weight of soil method.
  - (Part 14) - Part 14 Determination of density index (Relative density) of cohesion less soils.

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(Part 28) - Part 28 Determination of dry density of soils in place, by the sand replacement method.

(Part 33) - Part 33 Determination of the density in place by the ring and water replacement method.

(Part 34) - Part 34 Determination of density of soil in place by rubber balloon method.

(Part 38 - Part 38 Compaction control test (Hilf Method).

### 3 DRAWINGS:

The Engineer will furnish drawings wherever, in his opinion, such drawings are required to show areas to be excavated/filled grade level, sequence of priorities etc. The Contractor shall follow strictly such drawings.

### 4 GENERAL :

4.1 The Contractor shall furnish all tools, plants, instruments, qualified supervisory personnel, labour, materials any temporary works, consumables, any and everything necessary, whether or not such items are specifically stated herein for completion of the job in accordance with the specification requirements.

4.2 The contractor shall carry out the survey of the site before excavation and set properly all lines and establish levels for various works such as earthwork in excavation for grading, basement, foundations, plinth filling, roads, drains, cable trenches, pipelines etc. Such survey shall be carried out by taking accurate cross sections of the area perpendicular to established reference/grid lines at 15 m. intervals or nearer as determined by the Engineer based on ground profile. These shall be checked by the Engineer and thereafter properly recorded.

4.3 The excavation shall be done to correct lines and levels. This shall also include, where required, proper shoring to maintain excavations and also the furnishing, erecting and maintaining of substantial barricades around excavated areas and warning lamps at night for ensuring safety.

4.4 The rates quoted shall also include for dumping of excavated materials in regular heaps, burs, riprap with regular slopes as directed by the Engineer, within the lead specified and levelling the same so as to provide natural drainage. Rock / soil excavated shall be stacked properly as directed by the Engineer. As a rule, all softer material shall be laid along the center of heaps, the harder and more weather resisting materials forming the casing on the sides and the top. Rock shall be stacked separately.

4.5 The topsoil shall be stock piled for later re-use.

### 5. CLEARING :

5.1 The area to be excavated filled shall be cleared of fences, trees, plants, logs, stumps, bush, vegetation, rubbish, slush, etc. and other objectionable matter. If any roots or stumps of trees are met during excavation, they shall also be removed. The material so removed shall be burnt or disposed off as directed by the Engineer. Where earthfill is intended, the area shall be stripped of all loose / soft patches, top soil containing objectionable matter / materials before fill commences.

### 6. PRECIOUS OBJECTS, RELICS, OBJECTS OF ANTIQUITY, ETC.

6.1 All gold, silver, oil, minerals, archaeological and other findings of importance, trees cut or other materials of any description and all precious stones, coins, treasures, relics, antiquities and other similar things which may be found in or upon the site shall be the property of the

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Owner and the Contractor shall duly preserve the same to the satisfaction of the Owner and from time to time deliver the same to such person or persons as the Owner may from time to time authorize or appoint to receive the same.

#### 7. CLASSIFICATION :

7.1 All materials to be excavated shall be classified by the Engineer, into one of the following classes and shall be paid for at the rate tendered for that particular class of material. No distinction shall be made whether the material is dry, moist or wet. The decision of the Engineer regarding the classification of the material shall be final and binding on the Contractor and not be a subject matter of any appeal or arbitration.

7.2 Any earthwork will be classified under any of the following categories :

##### (A) Ordinary and Hard Soils

These shall include all kinds of soils containing kankar, sand, silt, murrum and/or shingle, gravel, clay, loam, peat, ash, shale, etc., which can generally be excavated by spade, pick axes and shovel, and which is not classified under "Soft and Decomposed Rock" and "Hard Rock" defined below. This shall also include embedded rock boulders not longer than 1 metre in any one direction and not more than 200 mm in any one of the other two directions.

##### (b) Soft and Decomposed Rock

This shall include rock, boulders, slag, chalk, slate, hard micaschist, laterite and all other materials which in the opinion of Engineer is rock, but does not need blasting and could be removed with picks, hammer, crow bars, wedges, and pneumatic breaking equipment. The mere fact that the Contractor resorts to blasting for reasons of his own, shall not qualify for classification under 'Hard Rock'. This shall also include excavation in macadam and tarred roads and pavements. This shall also include rock boulders not longer than 1 meter in any direction and not more than 500 mm in any one of the other two directions. Masonry to be dismantled will also be measured under this item.

##### ( c ) Hard Rock

This shall include all rock occurring in large continuous masses which cannot be removed except by blasting for loosening it. Harder varieties of rock with or without veins and secondary minerals which, in the opinion of the Engineer require blasting shall be considered as hard rock. Boulders of rock occurring in such sizes and not classified under (a) and (b) above shall also be classified as hard rock. Concrete work both reinforced and unreinforced to be dismantled will be measured under this item, unless a separate provision is made in the Schedule of Quantities.

#### 8. EXCAVATION:

8.1 All excavation work shall be carried out by mechanical equipment unless, in the opinion of the Engineer, the work involved and time schedule permit manual work.

8.2 Excavation for permanent work shall be taken out to such widths, lengths, depths and profiles as are shown on the drawings or such other lines and grades as may be specified by the Engineer. Rough excavation shall be carried out to a depth 150 mm above the final level. The balance shall be excavated with special care. Soft pockets shall be removed even below the final level and extra excavation filled up as directed by the Engineer. The final excavation if so instructed by the Engineer should be carried out just prior to laying the mudmat.

8.3 The Contractor may, for facility of work or similar other reasons excavate, and also backfill later, if so approved by the Engineer, at his own cost outside the lines shown on the drawings or directed by the Engineer. Should any excavation be taken below the specified elevations, the

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Contractor shall fill it up, with concrete of the same class as in the foundation resting thereon, upto the required elevation. No extra shall be claimed by the Contractor on this account.

8.4 All excavation shall be done to the minimum dimensions as required for safety and working facility. Prior approval of the Engineer shall be obtained by the Contractor in each individual case, for the method he proposes to adopt for the

excavation, including dimensions, side slopes, dewatering, disposal, etc. This approval, however, shall not in any way relieve the Contractor of his responsibility for any consequent loss or damage. The excavation must be carried out in the most expeditious and efficient manner. Side slopes shall be as steep as will stand safely for the actual soil conditions encountered. Every precaution shall be taken to prevent slips. Should slips occur, the slipped material shall be removed and the slope dressed to a modified stable slope. Removal of the slipped earth will not be paid for if the slips are due to the negligence of the Contractor.

8.5 Excavation shall be carried out with such tools, tackles and equipment as described hereinbefore. Blasting or other methods may be resorted to in the case of hard rock; however not without the specific permission of the Engineer.

8.6 The Engineer may also direct that in some extreme case, the rock may be excavated by heating and sudden quenching for splitting the rock. Firewood shall be used for burning and payment shall be made for such work as called for in the schedule of quantities.

#### 9. STRIPPING LOOSE ROCK

9.1 All loose boulders, semidetached rocks (along with earthy stuff which might move therewith) not directly in the excavation but so close to the area to be excavated as to be liable, in the opinion of the Engineer, to fall or otherwise endanger the workmen, equipment, or the work, etc., shall be stripped off and

removed away from the area of the excavation. The method used shall be such as not to shatter, or render unstable or unsafe the portion which was originally sound and safe.

9.2 Any material not requiring removal as contemplated in the work, but which, in the opinion of the Engineer, is likely to become loose or unstable later shall also be promptly and satisfactorily removed as directed by the Engineer. The cost of such stripping will be paid for at the unit rates accepted for the class of materials in question.

#### 10 TIMBER SHORING

##### 1.0 SCOPE

This specification covers the general requirements of timber shoring for excavation of trenches, pits, open excavation etc.

2.0 Close timbering shall be done by completely covering the sides of the trenches and pits generally with short, upright members called 'polling boards'. These shall be of minimum 25 cm x 4 cm sections or as directed by Engineer. The boards shall generally be placed in position vertically side by side without anygap on each side of the excavation and shall be secured by horizontal walling of strong wood at maximum 1.2 meters spacing, strutted with bellies or as directed by Engineer. The length of the bellies struts shall depend on the width of the trench or pit. If the soil is very soft and loose, the boards shall be placed horizontally against each side of the excavation and supported by vertical walling, which in turn shall be suitably strutted. The lowest boards supporting the sides shall be taken into the ground and no portion of the vertical side of the trench or pit shall remain exposed, so as to render the earth liable to slip out.

2.1 Timber shoring shall be 'close' or 'open' type, depending on the nature of soil and the depth of pit or trench. The type of timbering shall be as approved by engineer. It shall be the

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responsibility of contractor to take all necessary steps to prevent the sides of excavations, trenches, pits, etc., From collapsing.

2.2 Timber shoring may be required to keep the sides of excavations vertical to ensure safety of adjoining structures or to limit the slope of excavations, or due to space restrictions or for other reasons. Such shoring shall be carried out, except in an emergency, only under instructions from Engineer.

2.3 The withdrawal of the timber shall be done very carefully to prevent the collapse of the pit or trench. It shall be started at one end and proceeded with systematically to the other end. Concrete or masonry shall not be damaged during the removal of the timber. No claim shall be entertained for any timber which cannot be withdrawn and is lost or buried.

2.4 In the case of open timbering, the entire surface of the side of trench or pit is not required to be covered. The vertical boards of minimum 25 cm x 4 cm sections shall be spaced sufficiently apart to leave unsupported strips of maximum 50 cm average width. The detailed arrangement, sizes of the timber

and the spacing shall be subject to the approval of Engineer. In all other respects, specification for close timbering shall apply to open timbering.

2.5 In case of large pits and open excavations, where shoring is required for securing safety of adjoining structures or for any other reasons and where the planking for sides of excavations/pits cannot be strutted against, suitable inclined struts supported on the excavated bed shall be provided. Load from such struts shall be suitably distributed on the bed to ensure no yielding of the strut. If, however, Engineer directs any timbering to be left-in, keeping in mind the type of construction or any other factor, Contractor shall be paid for at the scheduled item-rate for such left-in timbering.

## **11 DEWATERING**

### **1.0 SCOPE**

This specification covers the general requirements of dewatering excavation in general.

### **2.0 DEWATERING**

2.1 The Contractor shall ensure that the excavation and the structures are free from water during construction and shall take all necessary precautions and measures to exclude ground/rain water so as to enable the works to be carried out in reasonably dry conditions in accordance with the construction program.

Sumps made for dewatering must be kept clear of the excavations / trenches required for further work. The method of pumping shall be approved by Engineer, but in any case, the pumping arrangement shall be such that there shall be no movement of subsoil or blowing in due to differential head of water during pumping. Pumping arrangements shall be adequate to ensure no delays in construction. The dewatering shall be continued for at least (7) seven days after the last pour of the concrete. The Contractor shall, however, ensure that no damage to the structure results on stopping of dewatering.

2.2 The Contractor shall study the sub-soil conditions carefully and shall conduct any tests necessary at the site with the approval of the Engineer to test the permeability and drainage conditions of the sub-soil for excavation, concreting etc., below ground level.

2.3 The scheme for dewatering and disposal of water shall be approved by the Engineer. The Contractor shall suitably divert the water obtained from dewatering from such areas of site where a buildup of water in the opinion of the Engineer obstructs the progress of the work, leads to in sanitary conditions by stagnation, retards the speed of construction and is detrimental to the safety of men, materials, structures and equipment.

2.4 When there is a continuous in flow of water and the quantum of water to be handled is considered in the opinion of Engineer, to be large, a well point system – single stage or

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multistage, shall be adopted. The Contractor shall submit to the Engineer, details of his well point system including the stages, the spacing, number and diameter of well points, headers etc., and the number, capacity and location of pumps for approval. Unless separately provided for in

the Schedule of prices,

The cost of dewatering shall be included in the item rate of excavation.

#### **MODE OF MEASUREMENT & PAYMENT**

Measurement & payment shall be made on cubic meter basis.

#### **ITEM NO.02 OF SCHEDULE B2:**

**Excavation for foundation for depth from 1.5 m to 3.0 m including sorting out and stacking of useful materials and disposing of the excavated directed by Engineer in charge from the end of the cutting with all required lead and lift within the estate.**

**As per Item No.8 of Schedule B2**

#### **ITEM NO.03 OF SCHEDULE B2:**

**P/L PCC 1:3:6 (1-cement : 3 coarse sand : 6 M/c stone aggregate 20 mm nominal size) in foundation concrete / floor concrete incl. machine mixing, ramming, consolidation & curing etc. incl. cost of form work if required etc. complete at all levels**

#### **Materials:**

Cement shall conform to M-2 and shall conform to M-3.

Coarse aggregate shall conform to M-4,5,7,& 8

Water shall conform to M-1.

#### **Workman ship:**

The proportion of cement to sand and coarse aggregate shall be 1:3:6 i.e. 1 Part of cement 3 part of sand and 6 part of coarse aggregate by Volume and the work shall be carried out as per C-2.

#### **Mode of Measurement and Payment:**

The mode of measurement shall be specified in I S 1200-Part II-1974 or as revised from time to time. So far as applicable for measurement of cement work.

**The rate shall be for unit of one cubic meter.**

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**ITEM NO.04 OF SCHEDULE B2:**

**Providing & Laying factory made equivalent precast U shape surface storm water drain 2000 mm long, T-25 load carrying capacity - 10 T Axle Load - 5 T Wheel Load confirming to JIS meeting IS requirements having high performance self-compacting concrete of M40 Cylinder Strength/ M50 Cube Strength & Fe 500 / Fe500D shall be use for reinforcement. The product shall have tie shape joint 10-20 mm width X 25 mm depth groove as per JIS on both sides of each Storm water drain for jointing two precast drains using cement mortar or suitable non shrink grout. The precast Storm water drain must consist of special in built inlets at appropriate location for fixing De-shackle for mechanical installation , including supply ,transportation ,installation on specific location at site in line ,level , gradient and plumb with necessary testing commissioning etc complete as per instruction of engineer in charge. In no case the casting shall be allowed to be prepared at site. It should be casted in the stringent atmospheric & pre-defined condition, as per approved QAP as by Engineer incharge. Installation of Precast Factory Made equivalent precast U shape surface storm water Drain and Precast Lid Cover.**

**1200 mm x 1200 mm ( In to In Dimension from top )**

**Material**

M-40 cylinder strength / M-50 cube strength Self Compacting Concrete using excellent quality river sand as per IS-383,maximum aggregate size <15 mm machine cut aggregates of approved quality & size as per IS-383, OPC -53 grade confirming to IS :269 of reputed brand having major cement plant , Super plasticizer as per IS-456, R.O. water as per IS-456. Fe 500/Fe 500D steel confirming to IS 1786 & Excellent Quality of welding rods ( as per relevant IS code) for manufacturing reinforcement cage, GI flange joint units, for fixing the reinforcement in place High grade plastic spacers and all other required material to produce the complete precast SWD Elements in all the aspects and respects.

**Workmanship at Precast Factory:**

The entire Precast SWD Elements shall be produced using excellent workmanship as per the detail and quality of the workmanship given below.

M-40 cylinder strength/M-50 cube strength High Performance - Self Compacting Concrete is mix created by using state of the art computer controlled customized batching plant within the factory. Fresh concrete will be taken to the assembly line & gently poured into the mould by remote control disposal in place. The mould is made out of using high grade automobile steel without any dent or damage.

The required reinforcement as per drawing by using Fe 500/Fe 500D steel is cut in to proper sizes by using proper re bar cutting machine. The separate steel member are combined together using excellent quality of welding done by welding machines to create the steel frame work/cage. The cage is given the appropriate shape by automatic bending machine which in reference the mould size and shape and as per the design to be put inside the mould. The

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entire steel assembly is kept into place inside the mould by using high grade necessary plastic spacers.

After pouring of SCC into the mould, the mould with filled in concrete shall be kept inside the factory. The entire assembly shall be kept for the minimum time period of 4 to 8 hrs. for steam curing to attain the desired strength of the product. The product will be kept for the period of approximately 14 days at production site prior to the dispatch from the production site. While pouring the concrete in to the mould the concrete samples are taken in the cylindrical mould as per IS code. Each precast unit should have date on manufacturing for traceability. The factory should provide concrete compressive test results along with dispatch of product from factory.

The stacking of precast unit shall be carried out as per the prescribed manner using wooden planks to avoid any damages. If any type of damage during the process of loading & unloading, lowering into trench, fixing at the location, takes place the contractor shall repair or remove & replace the same with the brand new piece without any extra cost as decided by consultant/client.

Product surfaces should have excellent quality smooth finish without any cracks, honeycombing or perforation & each piece should be certified by QC engineer of the factory. The bottom is kept slightly unsmooth finish for proper binding with bedding mortar.

This product is designed to take care of the forces generated while lifting it & placing it at the desire location at depth using the machinery like Hydra/Flanna. To facilitate the lifting of the precast SWD Elements, in-built special provisions are made for fixing appropriate tool to rotate& installation of the product.

#### **Workmanship at Installation Site:**

The precast SWD Elements units to be installed on about 100 mm thick P.C.C. / crushed stone foundation / levelling concrete of appropriate grade depending upon foundation soil condition prevailing at site. Quarry dust or sand bedding shall be done before placing of precast SWD as levelling course as directed by Engineer-in-charge

The contractor shall use total station survey / auto level equipment's to derive the line level as well as level of the bedding mortar. The level should be taken as interval of every 2 to 3 meters & shall be recorded properly & deposited with the client. In case of the flooding of the water in the excavated area it shall be responsibility of the contractor to carry out the dewatering without charging any extra cost. Any dirty water, garbage, shrubs, thorny bush etc. shall be removed by the contractor as & when required to carry out the work in complete satisfactory manner.

Any obstructions & any water supply, sewage, drainage, electrical, telephone, internet cables which need to be shifted due to laying of the precast drain shall be carried out by the contractor in consultation with client and engineer in charge. Complete and total care shall be taken by contractor not to damage any of the existing services and infrastructure while carrying the work at site.

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The jointing of two precast SWD Elements should be done by filling groove with appropriate non shrink grout material & by connecting bolt system in the in-built flanges for shear connection of two precast units. The Flange joint may be filled up with cement mortar non shrink grout to avoid corrosion of the connecting bolts or else GI bolt may be used. The drainage hole should be filled with suitable filter sheet/granule particles may be provided to release the pressure for surrounding water in each SWD Elements as per soil condition & as approved by consultant/client.

The entire assembly should be in line level & perfectly carried out at site as per the design, drawing & instruction given by engineer in charge.

The backfilling shall be carried out using the approved quality of excavated surplus soil as directed by engineer in charge. Layer wise backfilling of soil shall be carried out simultaneously on both the sides using appropriate plate compactor in such way that it should not displace the Precast SWD Elements from original line & level.

#### **Mode of Measurement & Payment:**

The mode of measurement includes manufacturing supplying , installation , testing & commissioning at site including transportation, insurance , loading & unloading all lead & lift expenses of hiring all tools, tackles & consumables labour charges dewatering, jungle cutting, removals of debris, unhygienic materials etc. All prevailing & applicable taxes as per government rules & regulations. The entire work shall be completed in excellent manner as per good engineering practices & up to the total satisfaction of engineering in charge.

The contractor shall prepare one sample by fixing a sample of about 50 running meter length as get the approval workmanship and installation methods. In case of any instruction from engineer in charge the contractor shall carry out necessary required changes to achieve the perfection in execution of the work at site.

The mode of measurement shall be in the unit of one running meter & the payment shall be **made per unit of 1 running meter.**

#### **ITEM NO.05 OF SCHEDULE B2:**

**Providing & laying factory made equivalent Precast Perforated Lid having length of 500 mm, width suitable for placing on DU - Shape Drain (DUSD) sizes 450 x 450 /600 X 600 / 750 X 750 / 900 X 900 mm, thickness of 130 / 145 / 150 / 150 mm respectively. Lid should have T-25 load carrying capacity – 10 T Axle Load – 5 T Wheel Load, confirming to JIS & meeting IS requirements having High Performance Self Compacting Concrete of M-40 cylinder strength/ M-50 cube strength. The Fe 500/ Fe500D shall be used for reinforcement. The each lid unit should have perforation & Different slit on two sides along the width of the lid for storm water intake. For DUSD 750 & D USD 900, each lid may have in-built, specially designed lifting inserts of appropriate load carrying capacity and fixed at specific location to avoid the tilting of the lid for safe & fast installation. In no case the casting shall be allowed to be prepared at site. It should**

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**be casted in the stringent atmospheric & pre-defined condition, as per approved Engineer in charge. Installation of Precast Factory Made equivalent precast U shape surface storm water Drain and Precast Lid Cover.  
1200 mm x 1200 mm ( In to In Dimension from top )**

Providing & laying factory made Precast Lid Element having size of 1200 mm X 1200 mm X 150 mm thick, suitable for placing on SWD Elements 1200 mm (w), T-25 load carrying capacity (pedestal load) confirming to JIS having High Performance Self Compacting Concrete of M-40 cylinder strength/ M-50 cube strength and having anti-skid finish at top with specially designed lifting inserts of appropriate load carrying capacity and fixed at specific location to avoid the tilting of the lid for safe & faster installation. The Fe 500/Fe 500D shall be used for reinforcement. The precast Lid must consist special arrangement at appropriate location for mechanical installation including supply, transportation, at site in line, level, gradient and plumb with necessary testing commissioning etc. complete as per instruction of engineer in charge. Precast Lid element should have embossed GIDC logo (as given by client) on top side.

### **Material**

M-40 cylinder strength / M-50 cube strength Self Compacting Concrete using excellent quality River sand as per IS-383, maximum aggregate size <15 mm machine cut aggregates of approved quality & size as per IS-383, OPC -53 grade confirming to IS :269 of reputed brand having major cement plant , Super plasticizer as per IS-456, R.O water as per IS-456. Fe 500/ Fe 500D steel confirming to IS 1786 & releasing agent for the form work as per the industry standard. Specially designed lifting inserts of appropriate load carrying capacity and fixed at specific location to avoid the tilting of the lid. Excellent Quality of welding rods (IS code) for manufacturing reinforcement cage, for fixing the reinforcement in place High grade plastic spacers. High quality lifting inserts of appropriate weight bearing capacity and all other required material to produce the complete precast lid of SWD Elements in all the aspects and respects.

### **Workmanship at Precast Factory:**

The entire precast lid Elements shall be produced using excellent workmanship as per the detail and quality of the workmanship given below.

M-40 cylinder strength/M-50 cube strength High Performance - Self Compacting Concrete is mix created by using state of the art computer controlled customised batching plant within the factory. Fresh concrete will be taken to the assembly line & gently poured into the mould by remote control disposal in place. The mould is made out of using high grade automobile steel without any dent or damage.

The required reinforcement as per drawing by using Fe 500 / Fe 500D steel is cut in to proper sizes by using proper re bar cutting machine. The separate steel member are combined together using excellent quality of welding done by welding machines to create the steel frame work/cage. The cage is given the appropriate shape by automatic bending machine which in reference the mould size and shape and as per the design to be put inside the mould. The entire steel assembly is kept into place inside the mould by using high grade necessary plastic spacers.

After pouring of SCC into the mould, the mould with filled in concrete shall be kept inside the factory. The entire assembly shall be kept for the minimum time period of 4 to 8 hrs. for steam curing to attain the desired strength of the product. The product will be kept for the period of approximately 14 days at production site prior to the dispatch from the production site. While pouring the concrete in to the mould the concrete samples are taken in the cylindrical mould as per IS code. Each precast unit should have date

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on manufacturing for traceability. The factory should provide concrete compressive test results along with dispatch of product from factory.

The stacking of precast unit shall be carried out as per the prescribed manner using wooden planks to avoid any damages. If any type of damage during the process of loading & unloading, lowering into trench, fixing at the location, takes place the contractor shall repair or remove & replace the same with the brand new piece without any extra cost as decided by consultant/client.

Product surfaces should have excellent quality smooth finish without any cracks, honeycombing or perforation & each piece should be certified by QC engineer of the factory.

This product is designed to take care of the forces generated while lifting it & placing it at the desire location at depth using the machinery like Hydra/Flanna. To facilitate the lifting of precast lid of SWD Elements, in-built special provisions are made for fixing appropriate tool to install the product.

#### **Workmanship at Installation Site:**

All the precast lid Elements to be installed in such a manner to minimize the joint width between to two adjoining lids. Two lid units per 2 m long Precast SWD Elements unit are required to be in place on top of the SWD Elements in the specified manner. For safe & faster mechanical installation of lid, use of appropriate eye bolt may be fixed in the special inserts provided on the top of the lid.

The lid should be installed only after jointing of SWD Elements units completed at site and in consultation / approval of client / consultant. Any obstructions, garbage etc. if any in the SWD Elements, the same shall be removed prior to installation of the lid on the SWD Elements.

The entire assembly should be in line level & perfectly carried out at site as per the design, drawing & instruction given by engineer in charge.

#### **Mode of Measurement & Payment:**

The Mode of measurement includes supplying ,installation ,testing & commissioning at site including transportation, insurance , loading & unloading all lead & lift expenses of hiring all tools, tackles & consumables labour charges dewatering, jungle cutting, removals of debris, unhygienic materials etc. All prevailing & applicable taxes as per government rules & regulations. The entire work shall be completed in excellent manner as per good engineering practices & up to the total satisfaction of engineering in charge.

The contractor shall prepare one sample by fixing the lids on a sample of 50 running meter length as get the approval workmanship and installation methods. In case of any instruction from engineer in charge the contractor shall carry out necessary required changes to achieve the perfection in execution of the work at site.

The mode of measurement shall be in the unit of **one running meter**& the payment shall be made per unit of 1 running meter.

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**ITEM NO.06 OF SCHEDULE B2:**

**Providing and Laying of factory made Precast Box Culvert units of 2000mm Length, confirming IS requirements, Grade of Concrete of M50 cube strength and using Fe 500D reinforcement bar designed for 5 T wheel Load with 0.2 m to 3 m earth cushion above it. Product also includes, male & female jointing system, groove for fixing rubber gasket, flange coupling jointing arrangements and special in-built hanging brackets at appropriate locations for faster & safe installation of the product. In no case the casting shall be allowed to be prepared at site. Installation of Precast Factory Made equivalent precast U shape surface storm water Drain and Precast Lid Cover. 1200 mm x 1200mm ( In to In Dimension from top )**

**General Requirement:**

- Length per unit of Box Culvert **1200 (W) X 1200 (H) X 2000 (L) mm**
- Size tolerance: + or – 2 mm
- Load carrying capacity – To withstand static or rolling load of heavy vehicles of T – 25 with a point load capacity of 5 Tonne.
- Concrete Surface – It shall have a smooth surface finish with low roughness coefficient for easy flow of water.

**Materials****Cement:**

Cement shall be ordinary portland cement 53 G OPC of major cement plants and should conform to IS-12269.

**Water:**

Water for mixing cement concrete shall not be salty or brackish and shall be clean reasonably clear and free from objectionable quantities of salt and traces of oil, acid and injurious alkali, salts, Chloride, Sulphate, TDS, organic matter and other deleterious materials which will either weaken the concrete or cause efflorescence or attack the steel in R.C.C. Water shall be obtained from sources approved by the Engineer. Sources of water shall be maintained at such a department and the water shall be withdrawn in such a manner as to exclude silt, mud, grass or other foreign material. Container for transport, storage and handling of water shall be clean.

**Fine aggregate:**

Sand for use in concrete work shall be natural sand or a crushed stone screening. Sand shall be clean, well graded, hard strong, durable and gritty particles free from injurious amount of dust, clay, kankar nodules, soft or flaky particles, shale, alkali, salts, organic matter, loam, mica or other deleterious materials and shall be approved by the Engineer.

**Coarse Aggregate:-**

Coarse aggregate shall consist of crushed or broken stone and be hard, stony, dense, and durable clean of proper gradation and free from skin and dotting likely to prevent proper adhesion of mortar. The aggregate shall generally be cubical in shape as far as possible. Flaky, elongated pieces shall be avoided. Stone shall have no deleterious reaction with cement single.

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**Type of Concrete:**

It shall be Self-Compacting High Performance Concrete of Grade M 50 having high resistance to Chloride, Sulphate & Chemical attack.

**Concrete Mix Proportion:**

Minimum grade of concrete M-50 having compressive strength of 50 Mpa in Cylinder Strength. Proportion of cement to fine and coarse aggregate is specified by weight as per Mix design 10262-2009.

**Mixing:-**

Concrete shall be manufactured in automated batching plant. Mechanical mixer should be used for all concrete work. Mixing shall be continued till there is a uniform distribution of materials, colour and uniform coating on coarse aggregate.

**Compaction:**

It shall be self-compacting concrete so there shall be no need for any compaction by Needle or any other methods.

**Curing:-**

Steam curing shall be done to be followed by water curing.

**Steel:**

Structural steel should conform to IS-1786. Fabrication and Erection should conform to IS-800-1992. Welding should conform to IS-816-1956.

Reinforcement is to be fixed in the positions shown on the drawings. Reinforcement is to be firmly tied to prevent movement when concrete is placed. Purpose made cover blocks and spacers shall be used as required

Bar binding shall be done by Weld only.

**Acceptance Criteria****Compressive Strength:**

The concrete shall be deemed to comply with the strength requirements of 50 Mpa with Cylinder strength. The mean strength determined from any group of four consecutive test results complies with the appropriate limits as per IS 456.

**Loading:** The box culvert shall be design for load as per IS code for size (1.2 x 1.2 x 2.0M).

**Design Specifications:** AASHTO standard specifications for highway bridges, 1996 edition with addenda.

All precast reinforced concrete box culverts shall conform to the latest edition of ASTM C 1433 or ASTM C 1577 or other equivalent standards. Details not conforming to these standards shall be submitted for approval along with design calculations using standard design program. The box culvert shall get approved for load test as per IS code.

Joints for precast sections shall be tongue and groove type and shall be sealed with mastic or sand/cement grout.

Lifting holes shall be filled with concrete plug after the box sections are in place.

Joint sealant and primer shall be included in the cost of box culvert.

**Mode of Measurement and Payment:**

The rate shall be for a unit of One Running Meter.

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## **SCHEDULE – B.**

IT. No.	DESCRIPTION OF ITEM	QTY.	UNIT	RATE	AMOUNT
1	Box cutting the road surface to proper slope and camber for making a base for road work including removing the excavated stuff and depositing on the road side slope as directed upto 50Mt.lead. (uSe This material in Filling Embankment item No-2)	7360.00	cu.m	104.20	766912.00
2	Earth work in embankment in 500 mm murrum/ yellow earth brought from outside having Effective CBR must be achieve 13.5 % incl. braking clods dressing, tempering, watering, rolling, consolidation of subgrade to required etc. incl.all conveyance and spreading, watering, rolling consolidation of layers at OMC to required density using power roller 8 to 10 tonne incl. filling of depressions that occursall labour material tools & plants as directed. as directed by Engineer-in-charge.	3315.00	cu.m	169.44	561693.60
3	Graded Granular sub base (GSB)Providing & laying Closed Graded Granular sub base (GSB) laying in uniform layer(each layer should be less than 200 mm)of graded granular material consisting of black trap machine cut crushed stone aggregate as per grading - V given in table 400-1 of the specification MORT&H and compactor to the required density with 8 - 10 tonne vibratory roller with plain drum or heavy pneumatic tyred roller of minimum 200 to 300 KN weight in all seasons as per MORT&H , maintaining the required slope & grade during the operation as approved by the engineer in charge & watering to the proper moisture content and sprinkled with the help of truck mounted water tank fitted with suitable arrangement. (fully saturated having CBR value minimum 30)	995.00	cu.m	1237.03	1230844.85

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4	Construction of dry lean cement concrete Sub-base over a prepared sub-grade with coarse and fine aggregate conforming to IS: 383, the size of coarse aggregate not exceeding 25 mm, aggregate cement ratio not to exceed 15:1, aggregate gradation after blending to be as per table 600-1, cement content not to be less than 150 kg/ cum, optimum moisture content to be determined during trial length construction, concrete strength not to be less than 10 Mpa at 7 days, mixed in a batching plant, transported to site, laid with a paver with electronic sensor, compacting with 8-10 tonnes vibratory roller, finishing and curing.	936.00	cu.m	2589.93	2424174.48
5	Construction of un-reinforced, dowel jointed, plain cement concrete pavement over a prepared sub base with 53 grade cement @ 440 kg per cum, coarse and fine aggregate conforming to IS 383, maximum size of coarse aggregate not exceeding 25 mm, mixed in a batching and mixing plant as per approved mix design, transported to site, laid with a fixed form or slip form paver, spread, compacted and finished in a continuous operation including cost of contraction, expansion, construction and longitudinal joints, joint filler, separation membrane, sealant primer, joint sealant, debonding strip, dowel bar, tie rod, admixtures as approved, curing compound, finishing to lines and grades as per drawing and EIC.	1814.00	cu.m	6513.45	11815398.30
6	Road marking with hot applied thermoplastic paints with reflectorising glass beads on bitumin surface providing and laying a hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250gms per sqm area, thickness of 2.5mm is excluding of surface applied glass beds as per IRC:35-2015. The finished surface to be level, uniform and free from streaks and holes. zebra patta /bump patta lane/center line/ edge line/cut patta. The white color marking should provide liminance coefficinnet on cemend road shalll be min 130 mcd/m2/lux and Asphalt road shall be min 100 mcd/m2/lux during the service life during the day time. The marking should meet the performance criteria for night time reflectivity, wet reflectivity and skid resistance as mentioned in the section-15 of IRC 35-2015. Warranty for the Retro reflectivity should be two years.	892.00	Sqm	367.72	328006.24

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7	Supplying and fixing cat eye (Stimsonite) made out from Acrilo beaultile sterine injuction high compressed molding with reflector made of MMC (prismatic type of size 12cm x 6cm x 2.5cm) provided with bituminous adhesive 100g. with each unit for fixing. (High Intensity grade)	200.00	No.	375.72	75144.00
8	Excavation for foundation upto 1.5m depth including sorting out and stacking of useful materials and disposing off the excavated stuff directed by Engineer in charge from the end of the cutting with all required lead and lift within the estate.	1404.00	cu.m	117.08	164380.32
9	Excavation for foundation for depth from 1.5 m to 3.0 m including sorting out and stacking of useful materials and disposing of the excavated directed by Engineer in charge from the end of the cutting with all required lead and lift within the estate.	1404.00	cu.m	129.81	182253.24
10	P/L PCC 1:3:6 (1-cement : 3 coarse sand : 6 M/c stone aggregate 20 mm nominal size) in foundation concrete / floor concrete incl. machine mixing, ramming, consolidation & curing etc. incl. cost of form work if required etc. complete at all levels	141.00	cu.m	3053.25	430508.25

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11	<p>Providing &amp; Laying factory made equivalent precast U shape surface storm water drain 2000 mm long, T-25 load carrying capacity - 10 T Axle Load - 5 T Wheel Load confirming to JIS meeting IS requirements having high performance self-compacting concrete of M40 Cylinder Strength/ M50 Cube Strength &amp; Fe 500 / Fe500D shall be use for reinforcement. The product shall have tie shape joint 10-20 mm width X 25 mm depth groove as per JIS on both sides of each Storm water drain for jointing two precast drains using cement mortar or suitable non shrink grout. The precast Storm water drain must consist of special in built inlets at appropriate location for fixing De-shackle for mechanical installation , including supply ,transportation ,installation on specific location at site in line ,level , gradient and plumb with necessary testing commissioning etc complete as per instruction of engineer in charge. In no case the casting shall be allowed to be prepared at site. It should be casted in the stringent atmospheric &amp; pre-defined condition, as per approved QAP as by Engineer incharge.Installation of Precast Factory Made equivalent precast U shape surface storm water Drain and Precast Lid Cover. 1200 mm x 1200 mm ( In to In Dimention from top )</p>	240.00	rmt	11871.00	2849040.00
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12	Providing & laying factory made equivalent Precast Perforated Lid having length of 500 mm, width suitable for placing on DU - Shape Drain (DUSD) sizes 450 x 450 / 600 X 600 / 750 X 750 / 900 X 900 mm, thickness of 130 / 145 / 150 / 150 mm respectively. Lid should have T-25 load carrying capacity – 10 T Axle Load – 5 T Wheel Load, confirming to JIS & meeting IS requirements having High Performance Self Compacting Concrete of M-40 cylinder strength/ M-50 cube strength. The Fe 500/ Fe500D shall be used for reinforcement. The each lid unit should have perforation & Different slit on two sides along the width of the lid for storm water intake. For DUSD 750 & D USD 900, each lid may have in-built, specially designed lifting inserts of appropriate load carrying capacity and fixed at specific location to avoid the tilting of the lid for safe & fast installation. In no case the casting shall be allowed to be prepared at site. It should be casted in the stringent atmospheric & pre-defined condition, as per approved Engineer in charge. Installation of Precast Factory Made equivalent precast U shape surface storm water Drain and Precast Lid Cover. 1200 mm x 1200 mm ( In to In Dimention from top )	240	rmt	5250.00	1260000.00
13	Providing and Laying of factory made Precast Box Culvert units of 2000mm Length, confirming IS requirements, Grade of Concrete of M50 cube strenght and using Fe 500D reinforcement bar designed for 5 T wheel Load with 0.2 m to 3 m earth cushion above it. Product also includes, male & female jointing system, groove for fixing rubber gasket, flange coupling jointing arrangements and special in-built hanging brackets at appropriate locations for faster & safe installation of the product. In no case the case the casting shall be allwed to be preparad at site. Installation of Precast Factory Made equivalent precast U shape surface storm water Drain and Precast Lid Cover. 1200 mm x 1200 mm ( In to In Dimention from top )	240	rmt	17404	4176960.00
				<b>Total</b>	<b>2,62,65,315.28</b>

Note: The Unit rates specified for various items to be executed as per Schedule "B" attached with the Price Bid are excluding GST but inclusive all labours, materials,

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testing charges, equipment, all incidental charges involving in the work and as specified in the Mode of measurement & payment of detailed specifications of items incl. all taxes, royalty, octroi, transportation cost etc. all as applicable presently as to be enforced for future by any / all including Central/State Government & Statutory bodies from time to time.

I / We agree to carry out the work at \_\_\_\_\_ % above the estimated tender rates  
\_\_\_\_\_ should be written in figures and words.

I / We agree to carry out the work at \_\_\_\_\_ % below the estimated tender rates  
\_\_\_\_\_ should be written in figures and words.

#### ESTIMATED AMOUNT

Put to tender **Rs.2,62,65,315.28**

ADD

% \_\_\_\_\_ above Rs. (+) \_\_\_\_\_

Net Rs. \_\_\_\_\_

Rupees in words : \_\_\_\_\_

#### ESTIMATED AMOUNT

Put to tender **Rs.2,62,65,315.28**

DEDUCT

% \_\_\_\_\_ below Rs. (-) \_\_\_\_\_

Net Rs. \_\_\_\_\_

Rupees in words : \_\_\_\_\_

1. (\*) Please strike out whichever is not applicable. All work shall be carried out as per the specifications of the GIDC or as directed.
2. All the columns in Schedule should be filled in ink and the total entries in the last column should be struck by the contractor under his signature.
3. Rate quoted included clearance of site (prior to commencement of work & at its close) in all respect & hold good for the work under all conditions, site moisture, weather etc.
4. I/We have read the tender/general specifications/ conditions and I/We agree to follow same and binding to me/us.

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