BIDDING DOCUMENT

for

THE PROCUREMENT OF

Upgrading of Bhimphedi-Kogate-Ipa-Deurali Road, 23.640 Km

National Competitive Bidding (NCB)

- Single-Stage: Two-Envelope Bidding Procedure -

IFB No: NRA/CLPIU/GMaLI/MAK/W/PDRF/01

Contract ID: NRA/CLPIU/GMaLI/MAK/W/PDRF/01

District Level Project Implementation Unit (DLPIU/GMaLI), Makwanpur

Issued on: 02-08-2018 06:00

Abbreviations

BD ... Bidding Document

BDF ... Bidding Forms

BDS ... Bid Data Sheet

BOQ ... Bill of Quantities

CLPIU ... Central Level Project Implementation Unit

COF ... Contract Forms

DCC ... District Co-ordination Committee

DLPIU ... District Level Project Implementation Unit

DP ... Development Partners

DoLIDAR ... Department of Local Infrastructure Development and Agricultural Roads

DTO ... District Technical Office

EEAP... Earthquake Emergency Assistance Project

ELI ... Eligibility

EQC ... Evaluation and Qualification Criteria

EXP ... Experience

FIN ... Financial

GCC ... General Conditions of Contract

GMaLI ... Grant Management and Local Infrastructure

GoN ... Government of Nepal

ICC ... International Chamber of Commerce

IFB ... Invitation for Bids

ITB ... Instructions to Bidders

JV ... Joint Venture

LIT ... Litigation

MoFAGA ... Ministry of Federal Affairs and General Administration

NCB ... National Competitive Bidding

NRA ... National Reconstruction Authority

PAN ... Permanent Account Number

PDRF ... Post Disaster Recovery Framework

PPA ... . Public Procurement Act

PPMO ... . Public Procurement Monitoring Office

PPR ... . Public Procurement Regulations

PL ... . Profit & Loss

SBD .... Standard Bidding Document

SCC .... Special Conditions of Contract

TS ... . Technical Specifications

VAT ... . Value Added Tax

WRQ ... . Works Requirements

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Invitation for Bids

Government of Nepal (GoN)

District Level Project Implementation Unit (DLPIU/GMaLI), Makwanpur

Invitation for Bids for the Upgrading of Bhimphedi-Kogate-Ipa-Deurali Road, 23.640 Km

IFB No: NRA/CLPIU/GMaLI/MAK/W/PDRF/01

Contract Identification No: NRA/CLPIU/GMaLI/MAK/W/PDRF/01

Date of publication: 02-08-2018 06:00

1. The Government of Nepal [GoN] has allocated funds towards the cost of Upgrading of Bhimphedi-Kogate-Ipa-Deurali Road, 23.640 Km and intends to apply part of the funds to cover eligible payments under the Contract for Upgrading of Bhimphedi-Kogate-Ipa-Deurali Road, 23.640 Km (Contract No: NRA/CLPIU/GMaLI/MAK/W/PDRF/01). Bidding is open to all eligible bidders as per Section V of Bidding Document

2. District Level Project Implementation Unit (DLPIU/GMaLI), Makwanpur invites electronic bids from eligible bidders for the construction of Upgrading of Bhimphedi-Kogate-Ipa-Deurali Road, 23.640 Km under National Competitive Bidding – Single Stage Two Envelope Bidding procedures.

   Only eligible bidders with the following key qualifications should participate in this bidding:

   Minimum Average Annual Construction Turnover of the best 3 years within the last 10 years: 270000000
   Minimum Work experience of similar size and nature: 300000000

3. Under the Single Stage, Two Envelope Procedure, Bidders are required to submit simultaneously two separate sealed envelopes, one containing (i) the Technical Bid and the other (ii) the Price Bid, both in turn enclosed in one sealed envelope as per the provision of ITB 21 of the Bidding Document.

4. Eligible Bidders may obtain further information and inspect the Bidding Documents at the office of District Level Project Implementation Unit (DLPIU/GMaLI), Makwanpur, Hetauda, Makwanpur, Nepal or may visit PPMO e-GP system www.bolpatra.gov.np/egp.

5. A complete set of Bidding Documents may be purchased from the office District Level Project Implementation Unit (DLPIU/GMaLI), Makwanpur, Hetauda, Makwanpur, Nepal by eligible Bidders on the submission of a written application, along with the copy of company/firm registration certificate, and upon payment of a non-refundable fee of 20000.0 NRs. till 02-09-2018 17:00 during office hours.

   Or

   Bidder who chooses to submit their bid electronically may purchase the hard copy of the bidding documents as mentioned above or may download the bidding documents for e-submission from PPMO's e-GP system www.bolpatra.gov.np/egp. Bidders, submitting their bid electronically, should deposit the cost of bidding document in the Project's Rajaswa (revenue) account as specified below

   Information to deposit the cost of bidding document in Bank:

Name of the Bank:	Nepal Bank Ltd. , Hetauda City Office ,Hetauda Makwanpur Hetauda 0
Name of the Office:	District Level Project Implementation Unit (DLPIU/GMaLI), Makwanpur
Office Code no:	31-301-02
Office Account no:	02501000000000014000
Revenue Head No.:	14227

6. Pre-bid meeting shall be held at District Level Project Implementation Unit (DLPIU/GMaLI), Makwanpur
Hetauda
Makwanpur
Nepal at 17-08-2018 13:00 hours.

7. Sealed or electronic bids must be submitted to the office District Level Project Implementation Unit (DLPIU/GMaLI), Makwanpur, Hetauda, Makwanpur, Nepal by hand/courier or through PPMO's e-GP system www.bolpatra.gov.np/egp on or before 03-09-2018 12:00. Bids received after this deadline will be rejected.

8. The bids will be opened in the presence of Bidders' representatives who choose to attend at 03-09-2018 13:00 hours at the office of District Level Project Implementation Unit (DLPIU/GMaLI), Makwanpur
Hetauda
Makwanpur
Nepal. Bids must be valid for a period of 120 days after bid opening and must be accompanied by a bid security or scanned copy of the bid security in pdf format in case of e-bid, amounting to a minimum of NRs. 11000000 which shall be valid for 30 days beyond the validity period of the bid.

9. If the last date of purchasing and /or submission falls on a government holiday, then the next working day shall be considered as the last date. In such case the validity period of the bid security shall remain the same as specified for the original last date of bid submission.

10. Evaluation and Qualification Criteria:

Contracts of Similar Size and Nature:

300000000

Average Annual Construction Turnover:

270000000

Financial Resources

[Note: If the bid evaluation process and the decision for the award of the Contract takes more than one (1) year from the date of bid submission, Bidders shall be asked to resubmit their current contract commitments and latest information on financial resources supported by latest audited accounts or audited financial statements, or if not required by the law of the Bidder's country, other financial statements acceptable to the Employer, and the Bidders' financial capacity shall be reassessed on this basis.]
:

Using Forms FIN - 3 and FIN - 4 in Section IV (Bidding Forms) the Bidder must demonstrate access to, or availability of, financial resources such as liquid assets, unencumbered real assets, lines of credit, and other financial means, other than any contractual advance payments to meet its current Contract Commitments, plus:
The following cash - flow requirement, NRs. 120,000,000
For Single Entity : Must meet requirement
For joint Venture : All combined partner Must meet requirements, Each partner Must meet 25% of the requirement, One partner must meet 40% of the requirements.
Documents Submission Requirements : Form FIN - 3 and Form FIN - 4

Note:
(5) Construction cash flow requirement for a number of months (to the nearest half-month), determined as the total time needed by the Employer to pay a contractor's invoice, allowing for (a) the actual time consumed for construction, from the beginning of the month invoiced, (b) the time needed by the Project Manager to issue the monthly payment certificate, (c) the time needed by the Employer to pay the amount certified, and (d) a contingency period of one month to allow for unforeseen delays. The total period should not exceed six months. The assessment of the monthly amount should be based on a straight-line projection of the estimated cash flow requirement over the particular contract period, neglecting the effect of any advance payment and retention monies, but including contingency allowances in the estimated contract cost.
(6) Usually not less than 25 %
(7) Usually not less than 40 %

Part I: Bidding Procedures

Section I: Instructions to Bidders

A. General	
1. Scope of Bid	1.1 In connection with the Invitation for Bids indicated in the Bid Data Sheet (BDS), the Employer, as indicated in the BDS, issues this Bidding Document for the procurement of Works as specified in Section VI (Works Requirements). The ***name, identification, and number*** of Contracts of the National Competitive Bidding (NCB) are **provided in the BDS.**
	1.2 Throughout this Bidding Document: (a)the term "in writing" means communicated in written form and delivered against receipt; (b) except where the context requires otherwise, words indicating the singular also include the plural and words indicating the plural also include the singular; and (c) "day" means calendar day.
2. Source of Funds	2.1 GoN Funded: In accordance with its annual program and budget, approved by the GoN, the implementing agency **indicated in the BDS** plans to apply a portion of the allocated budget to eligible payments under the contract(s) for which this Bidding Document is issued. Or Public Entities' own Resource Funded: In accordance with its annual program and budget, approved by the public entity, the implementing agency **indicated in the BDS** plans to apply a portion of the allocated budget to eligible payments under the contract(s) for which this Bidding Document is issued. Or DP Funded: The GoN has applied for or received financing (hereinafter called "funds") from the Development Partner (hereinafter called "the DP") **indicated in the BDS** toward the cost of the project named in the BDS. The GoN intends to apply a portion of the funds to eligible payments under the contract(s) for which this Bidding Document is issued.
	2.2 DP Funded: Payment by the DP will be made only at the request of the GoN and upon approval by the DP in accordance with the terms and conditions of the financing agreement between the GoN and the DP (hereinafter called the "Loan/Grant Agreement"), and will be subject in all respects to the terms and conditions of that Loan/Grant Agreement. No party other than the GoN shall derive any rights from the Loan Agreement or have any claim to the funds.
3. Fraud and Corruption	3.1 Procuring Entities as well as Bidders, suppliers and contractors and their sub-contractors shall adhere to the highest standard of ethics during the

	procurement and execution of such contracts. In pursuance of this:; (a) the Employer adopts, for the purposes of this provision, the terms as defined below: (i) "corrupt practice" means the offering, giving, receiving, or soliciting, directly or indirectly, anything of value to influence improperly the actions of another party; (ii) "fraudulent practice" means any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation; (iii) "coercive practice" means impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party; (iv) "collusive practice" means an arrangement between two or more parties designed to achieve an improper purpose, including influencing improperly the actions of another party. v) "obstructive practice" means (a) deliberately destroying, falsifying, altering, or concealing of evidence material to an investigation; (b) making false statements to investigators in order to materially impede an investigation; (c) failing to comply with requests to provide information, documents, or records in connection with an investigation; (d) threatening, harassing, or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or (e) materially impeding GoN/DP's contractual rights of audit or access to information; and vi) "integrity violation" is any act which violates Anticorruption Policy, including (i) to (v) above and the following: abuse, conflict of interest, violations of GoN/DP sanctions, retaliation against whistleblowers or witnesses, and other violations of Anticorruption Policy, including failure to adhere to the highest ethical standard. (b) the Employer will reject a proposal for award if it determines that the Bidder recommended for award has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations in competing for the contract;
	(c) DP will cancel the portion of the financing allocated to a contract if it determines at any time that representative(s) of the GoN or of a beneficiary of DP-financing engaged in corrupt, fraudulent, collusive, or coercive practices or other integrity violations during the procurement or the execution of that contract, without the GoN having taken timely and appropriate action satisfactory to DP to remedy the situation. (d) DP will impose remedial actions on a firm or an individual, at any time,

	in accordance with DP's Anticorruption Policy and related Guidelines (as amended from time to time), including declaring ineligible, either indefinitely or for a stated period of time, to participate in DP-financed, -administered, or -supported activities or to benefit from an DP-financed, -administered, or -supported contract, financially or otherwise, if it at any time determines that the firm or individual has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations; and (e) The Contractor shall permit the GoN/DP to inspect the Contractor's accounts and records relating to the performance of the Contractor and to have them audited by auditors appointed by the GoN/DP, if so required by the GoN/DP.
	3.2 The Bidder shall not carry out or cause to carry out the following acts with an intention to influence the implementation of the procurement process or the procurement agreement : (a) give or propose improper inducement directly or indirectly, (b) distortion or misrepresentation of facts, (c) engaging in corrupt or fraudulent practice or involving in such act, (d) interference in participation of other competing bidders, (e) coercion or threatening directly or indirectly to cause harm to the person or the property of any person to be involved in the procurement proceedings, (f) collusive practice among bidders before or after submission of bids for distribution of works among bidders or fixing artificial/uncompetitive bid price with an intention to deprive the Employer the benefit of open competitive bid price, (g) Contacting the Employer with an intention to influence the Employer with regards to the bids or interference of any kind in examination and evaluation of the bids during the period from the time of opening of the bids until the notification of award of contract.
	3.3 PPMO, on the recommendation of the Procuring Entity may blacklist a Bidder for a period of one (1) to three (3) years for its conduct including on the following grounds and seriousness of the act committed by the bidder: (a) if convicted by a court of law in a criminal offence which disqualifies the Bidder from participating in the contract, (b) if it is established that the contract agreement signed by the Bidder was based on false or misrepresentation of Bidder's qualification information, (c)if it at any time determines that the firm has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices in competing for, or in executing, a GoN/DP-financed contract. (d) if the Successful Bidder fails to sign the Contract.
	3.4 A bidder declared blacklisted and ineligible by the GoN, Public Procurement Monitoring Office (PPMO) and/or the DP in case of DP

	funded project, may be ineligible to bid for a contract during the period of time determined by the GoN, PPMO and/or the DP.
	3.5 Furthermore, Bidders shall be aware of the provisions of GCC (GCC 28.3 and 72.3(j).
4. Eligible Bidders	4.1 A Bidder may be a natural person, private entity, or government owned entity subject to ITB 4.5 or any combination of them in the form of a Joint Venture (JV) under an existing agreement, or with the intent to constitute a legally-enforceable joint venture. In the case of a JV: (a) all partners shall be jointly and severally liable for the execution of the Contract in accordance with the Contract terms. Maximum number of JV shall be as **specified in the BDS.** and (b) the JV shall nominate a Representative who shall have the authority to conduct all business for and on behalf of any and all the parties of the JV during the bidding process and, in the event the JV is awarded the Contract, during Contract execution.
	4.2 A Bidder, and all parties constituting the Bidder, shall have the nationality of an eligible country, in accordance with Section V (Eligible Countries). A Bidder shall be deemed to have the nationality of a country if the Bidder is a citizen or is constituted, or incorporated, and operates in conformity with the provisions of the laws of that country. This criterion shall also apply to the determination of the nationality of proposed sub-contractors or suppliers for any part of the Contract including related services.
	4.3 A Bidder shall not have a conflict of interest. A Bidder found to have a conflict of interest shall be disqualified. A Bidder may be considered to be in a conflict of interest with one or more parties in this bidding process, if any of, including but not limited to, the following apply: (a) they have controlling shareholders in common; or (b) they receive or have received any direct or indirect subsidy from any of them; or (c) they have the same legal representative for purposes of this bid; or (d) they have a relationship with each other, directly or through common third parties, that puts them in a position to have access to material information about or improperly influence the Bid of another Bidder, or influence the decisions of the Employer regarding this bidding process; or (e) a Bidder participates in more than one bid in this bidding process either individually or as a partner in a joint venture. This will result in the disqualification of all Bids in which it is involved. However, subject to any finding of a conflict of interest in terms of ITB 4.3 (a)-(d) above, this does not limit the participation of the same subcontractor in more than one bid; or (f) a Bidder or any of its affiliated entity, participated as a consultant in the preparation of the design or technical specifications of the works

	that are the subject of the Bid; or (g) a Bidder was affiliated with a firm or entity that has been hired (or is proposed to be hired) by the Employer as Engineer for the Contract.
	4.4 A firm that is under a declaration of ineligibility by the GoN in accordance with ITB 3, at the date of the deadline for bid submission or thereafter, shall be disqualified. A firm shall not be eligible to participate in any procurement activities under an DP-financed, -administered, or -supported project while under temporary suspension or debarment by DP pursuant to the DP's Anticorruption Policy (see ITB 3), whether such debarment was directly imposed by the DP, or enforced by other DPs pursuant to the Agreement for Mutual Enforcement of Debarment Decisions. A bid from a temporary suspended or debarred firm will be rejected.
	4.5 Enterprises owned by Government shall be eligible only if they can establish that they are legally and financially autonomous and operate under commercial law, and that they are not a dependent agency of the GoN.
	4.6 Bidders shall provide such evidence of their continued eligibility satisfactory to the Employer, as the Employer shall reasonably request.
	4.7 Firms shall be excluded in any of the cases, if (a) by an act of compliance with a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations, Nepal prohibits any import of goods or Contracting of works or services from that country or any payments to persons or entities in that country. Where Nepal prohibits payments to a particular firm or for particular goods by such an act of compliance, that firm may be excluded; (b) DP Funded: as a matter of law or official regulation, Nepal prohibits commercial relations with that country, provided that the DP is satisfied that such exclusion does not preclude effective competition for the supply of goods or related services required; (c) DP Funded: a firm sanctioned or temporarily suspended by the DP in relation to their guidelines or appropriate provisions on preventing and combating fraud and corruption in projects financed by them.
	4.8 In case a prequalification process has been conducted prior to the bidding process, this bidding is open only to prequalified Bidders.
5. Eligible Materials, Equipment and Services	5.1 The materials, equipment and services to be supplied under the Contract shall have their origin in any source countries as defined in accordance with Section V (Eligible Countries) and all expenditures under the Contract will be limited to such materials, equipment, and services. At the Employer's request, Bidders may be required to provide evidence of the origin of materials, equipment and services.

	5.2 For purposes of ITB 5.1 above, "origin" means the place where the materials and equipment are mined, grown, produced or manufactured, and from which the services are provided. Materials and equipment are produced when, through manufacturing, processing, or substantial or major assembling of components, a commercially recognized product results that differs substantially in its basic characteristics or in purpose or utility from its components.
B. Contents of Bidding Documents	
6. Sections of Bidding Document	6.1 The Bidding Document consist of Parts I, II, and III, which include all the Sections indicated below, and should be read in conjunction with any Addenda issued in accordance with ITB 8. PART I Bidding Procedures Section I Instructions to Bidders (ITB) Section II Bid Data Sheet (BDS) Section III Evaluation and Qualification Criteria (EQC) Section IV Bidding Forms (BDF) Section V Eligible Countries PART II Requirements Section VI Works Requirements (WRQ) Section VII Bill of Quantities (BOQ) PART III Conditions of Contract and Contract Forms Section VIII General Conditions of Contract (GCC) Section IX Special Conditions of Contract (SCC) Section X Contract Forms (COF)
	6.2 The Invitation for Bids issued by the Employer is not part of the Bidding Document.
	6.3 The Employer is not responsible for the completeness of the Bidding Document and their Addenda, if they were not obtained directly from the source stated by the Employer in the Invitation for Bids.
	6.4 The Bidder is expected to examine all instructions, forms, terms, and specifications in the Bidding Document and to furnish with its bid all information and documentation as is required by the Bidding Documents. Failure to furnish all information or documentation required by the Bidding Document may result in the rejection of the bid.
7. Clarification of Bidding Document, Site Visit, Pre-Bid Meeting	7.1 A prospective Bidder requiring any clarification of the Bidding Document shall contact the Employer in writing at the Employer's address **indicated in BDS** or raise any question or curiosity during the pre-bid meeting if provided for in accordance with ITB 7.4.The Employer will respond in writing to any request for clarification, provided that such request is received within the period as mentioned in ITB 7.5. The Employer shall forward copies of its response to all Bidders who have acquired the Bidding Document in accordance with ITB 6.3, including a description of the inquiry but without identifying its source. Should the Employer deem it necessary to amend the Bidding Document as a result of a request for clarification, it shall do so following the procedure under ITB 8 and ITB 22.2.

	7.2 The Bidder is advised to visit and examine the Site of Works and its surroundings and obtain for itself, on its own risk and responsibility, all information that may be necessary for preparing the bid and entering into a Contract for construction of the Works. The costs of visiting the Site shall be at the Bidder's own expense.
	7.3 The Bidder and any of its personnel or agents will be granted permission by the Employer to enter upon its premises and lands for the purpose of such visit, but only upon the express condition that the Bidder, its personnel, and agents will release and indemnify the Employer and its personnel and agents from and against all liability in respect thereof, and will be responsible for death or personal injury, loss of or damage to property, and any other loss, damage, costs, and expenses incurred as a result of the inspection.
	7.4 The Bidder's designated representative is invited to attend a pre-bid meeting, if **provided for in the BDS**. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.
	7.5 The Bidder is requested, to submit any questions in writing, to reach the Employer as **mentioned in BDS.**
	7.6 Minutes of the pre-bid meeting, including the text of the questions raised, without identifying the source, and the responses given, together with any responses prepared after the meeting, will be transmitted promptly to all Bidders who have acquired the Bidding Document in accordance with ITB 6.3. Any modification to the Bidding Document that may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of an addendum pursuant to ITB 8 and not through the minutes of the pre-bid meeting.
	7.7 Non attendance at the pre-bid meeting will not be a cause for disqualification of a Bidder.
8. Amendment of Bidding Document	8.1 At any time prior to the deadline for submission of bids, the Employer may amend the Bidding Document by issuing agenda.
	8.2 Any addendum issued shall be part of the Bidding Document and shall be communicated in writing to all who have obtained the Bidding Document from the Employer in accordance with ITB 6.3.
	8.3 To give prospective Bidders reasonable time in which to take an addendum into account in preparing their Bids, the Employer may, at its discretion, extend the deadline for the submission of Bids, pursuant to ITB 22.2
C. Preparation of Bids	
9. Cost of Bidding	9.1 The Bidder shall bear all costs associated with the preparation and submission of its Bid, and the Employer shall in no case be responsible or

	liable for those costs, regardless of the conduct or outcome of the bidding process.
10. Language of Bid	10.1 The Bid, as well as all correspondence and documents relating to the bid exchanged by the Bidder and the Employer, shall be written in the language **specified in the BDS**. Supporting documents and printed literature that are part of the Bid may be in another language provided they are accompanied by an accurate translation of the relevant passages in the language **specified in the BDS**, in which case, for purposes of interpretation of the Bid, such translation shall govern.
11. Documents Comprising the Bid	11.1 The Bid shall comprise two envelopes submitted simultaneously, one called the Technical Bid containing the documents listed in ITB 11.2 and the other the Price Bid containing the documents listed in ITB 11.3, both envelopes enclosed together in an outer single envelope. 11.2 The Technical Bid shall comprise the following: (a) Letter of Technical Bid; (b) Bid Security in accordance with ITB 19; (c) alternative Technical Bid, at Bidder's option and if permissible, in accordance with ITB 13; (d) written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 20.2; (e) documentary evidence in accordance with ITB 17, establishing the Bidder's qualifications to perform the contract; (f) Technical Proposal in accordance with ITB 16; (g) Bids submitted by a Joint Venture shall include a copy of the Joint Venture Agreement entered into by all partners. Alternatively, a Letter of Intent to execute a Joint Venture Agreement in the event of a successful Bid shall be signed by all partners and submitted with the Bid, together with a copy of the proposed agreement. The Joint Venture agreement, or letter of intent to enter into a Joint Venture including a draft agreement shall indicate at least the parts of the Works to be executed by the respective partners; and (h) Any other document required in the **BDS**. 11.3 The Price Bid shall comprise the following: (a) Letter of Price Bid; (b) completed Bill of Quantities(BoQ), in accordance with ITB 12 and ITB 14, or as stipulated in the BDS; (c) alternative price Bids, at Bidder's option and if permissible, in accordance with ITB 13; (d) Any other document required in the **BDS**.
	11.4 The Bidder is solely responsible for the authenticity of the submitted documents.
12. Letter of Bid and	12.1 The Letters of Technical Bid and Price Bid, Schedules, and all

Schedules	documents listed under ITB 11, shall be prepared using the relevant forms in Section IV (Bidding Forms) and in Section VII (Bill of Quantities). The forms must be completed without any alterations to the text, and no substitutes shall be accepted. All blank spaces shall be filled in with the information requested.
13. Alternative Bids	13.1 Unless otherwise **specified in the BDS**, alternative bids shall not be considered.
	13.2 When alternative times for completion are explicitly invited, a statement to that effect will be **included in the BDS**, as will the method of evaluating different times for completion.
	13.3 When specified in the BDS pursuant to ITB 13.1, and subject to ITB 13.4 below, Bidders wishing to offer technical alternatives to the requirements of the Bidding Document must first price the Employer's design as described in the Bidding Document and shall further provide all information necessary for a complete evaluation of the alternative by the Employer, including drawings, design calculations, technical specifications, breakdown of prices, and proposed construction methodology and other relevant details. Only the technical alternatives, if any, of the lowest evaluated Bidder conforming to the basic technical requirements shall be considered by the Employer.
	13.4 When **specified in the BDS**, Bidders are permitted to submit alternative technical solutions for specified parts of the Works. Such parts will be **identified in the BDS** and described in Section VI (Works Requirements). The method for their evaluation will be stipulated in Section III (Evaluation and Qualification Criteria).
14. Bid Prices and Discounts	14.1 The prices and discounts quoted by the Bidder in the Letter of Price Bid and in the Schedules shall conform to the requirements specified below.
	14.2 The Bidder shall submit a bid for the whole of the works described in ITB 1.1 by filling in prices for all items of the Works, as identified in Section VII (Bill of Quantities). In case of Unit Rate Contracts, the Bidder shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Items against which no rate or price is entered by the Bidder will not be paid for by the Employer when executed and shall be deemed covered by the rates for other items and prices in the Bill of Quantities.
	14.3 The price to be quoted in the Letter of Price Bid shall be the total price of the Bid, excluding any discounts offered. Absence of the total price in the Letter of Price Bid or the Bid Price in the Bill of Quantities shall result in rejection of the Bid.
	14.4 The Bidder shall quote any discounts and the methodology for their application in the Letter of Price Bid, in accordance with ITB 12.1.
	14.5 If so indicated in ITB 1.1, bids are invited for individual Contracts or for any combination of Contracts (packages). Bidders wishing to offer any price

	reduction for the award of more than one Contract shall specify in their bid the price reductions applicable to each package, or alternatively, to individual Contracts within the package. Price reductions or discounts shall be submitted in accordance with ITB 14.4, provided the Bids for all Contracts are submitted and opened at the same time.
	14.6 Unless otherwise **provided in the BDS** and the Conditions of Contract, the prices quoted by the Bidder shall be fixed. If the prices quoted by the Bidder are subject to adjustment during the performance of the Contract in accordance with the provisions of the Conditions of Contract, the Bidder shall furnish the indices and weightings for the price adjustment formulae in the Table of Adjustment Data in Section IV (Bidding Forms) and the Employer may require the Bidder to justify its proposed indices and weightings.
	14.7 All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, as of the date 30 days prior to the deadline for submission of bids, shall be included in the rates and prices and the total bid price submitted by the Bidder.
15. Currency of Bid and Payment	15.1 The currency of the bid and payment shall be in Nepalese Rupees.
16. Documents Comprising the Technical Proposal	16.1 The Bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule and any other information as stipulated in Section IV (Bidding Forms), in sufficient detail to demonstrate the adequacy of the Bidders' proposal to meet the work requirements and the completion time.
17. Documents Establishing the Qualifications of the Bidder	17.1 To establish its qualifications to perform the Contract in accordance with Section III (Evaluation and Qualification Criteria) the Bidder shall provide the information requested in the corresponding information sheets included in Section IV (Bidding Forms).
18. Period of Validity of Bids	18.1 Bids shall remain valid for the period **specified in the BDS** after the bid submission deadline date prescribed by the Employer. A bid valid for a shorter period shall be rejected by the Employer as nonresponsive.
	18.2 In exceptional circumstances, prior to the expiration of the bid validity period, the Employer may request Bidders to extend the period of validity of their Bids. The request and the responses shall be made in writing. If a bid security is requested in accordance with ITB 19, it shall also be extended 30 days beyond the deadline of the extended validity period. A Bidder may refuse the request without forfeiting its bid security. A Bidder granting the request shall not be required or permitted to modify its Bid.
19. Bid Security	19.1 The Bidder shall furnish as part of its bid, in original form, a bid security as **specified in the BDS**. In case of e-submission of bid, the Bidder shall

	upload scanned copy of Bid security letter at the time of electronic submission of the bid. The Bidder accepts that the scanned copy of the Bid security shall, for all purposes, be equal to the original. The details of original Bid Security and the scanned copy submitted with e-bid should be the same otherwise the bid shall be non-responsive.
	19.2 The bid security shall be, at the Bidder's option, in any of the following forms: (a) an unconditional bank guarantee from "A" class commercial bank or; (b) a cash deposit voucher in the Employer's Account as **specified in BDS**. In the case of a bank guarantee, the bid security shall be submitted either using the Bid Security Form included in Section IV (Bidding Forms) or in another Form acceptable to the employer. The form must include the complete name of the Bidder. The bid security shall be valid for minimum thirty (30) days beyond the original validity period of the bid, or beyond any period of extension if requested under ITB 18.2.
	19.3 The bid security issued by any foreign Bank outside Nepal must be counter guaranteed by an "A" class commercial Bank in Nepal.
	19.4 Any bid not accompanied by an enforceable and substantially compliant bid security shall be rejected by the Employer as nonresponsive. In case of e- Submission, if the scanned copy of an acceptable Bid Security letter is not uploaded with the electronic Bid then Bid shall be rejected.
	19.5 The bid security of unsuccessful Bidders shall be returned within three days, once the successful Bidder's furnishing of the required performance security and signing of the Contract Agreement pursuant to ITB 40.1 and 41.1
	19.6 The bid security shall be forfeited if: GoN funded : (a) a Bidder requests for withdrawal or modification of its bid, except as provided in ITB 18.2: (i) during the period of bid validity specified by the Bidder on the Letter of Technical Bid and Price Bid, in case of electronic submission; (ii) from the period twenty-four hours prior to bid submission deadline up to the period of bid validity specified by the Bidder on the Letter of Technical Bid and Price Bid, in case of hard copy submission. (b)a Bidder changes the prices or substance of the bid while providing information pursuant to clause 27.1; (c) a Bidder involves in fraud and corruption pursuant to clause 3.1; (d) the successful Bidder fails to: (i) furnish a performance security in accordance with ITB 40.1; (ii) sign the Contract in accordance with ITB 41.1; or

	(iii) accept the correction of arithmetical errors pursuant to clause 33.1 DP funded: The bid security shall be forfeited (a) if a Bidder withdraws its bid during the period of bid validity specified by the Bidder on the Letters of Technical Bid and Price Bid, except as provided in ITB 18.2; or (b) if the successful Bidder fails to (i) furnish a performance security in accordance with ITB 40.1; or (ii) sign the Contract in accordance with ITB 41.1; (iii) accept arithmetical corrections in accordance with ITB 33.1;
	19.7 The Bid Security of a Joint Venture shall be in the name of the Joint Venture that submits the bid. If the Joint Venture has not been legally constituted at the time of bidding, the Bid Security shall be in the names of all future partners as named in the letter of intent mentioned in ITB 4.1.
20. Format and Signing of Bid	20.1 The Bidder shall prepare one original set of the Technical Bid and one original of the Price Bid comprising the Bid as described in ITB 11 and clearly mark it **"ORIGINAL – TECHNICAL BID"** and **"ORIGINAL – PRICE BID."** Alternative bids, if permitted in accordance with ITB 13, shall be clearly marked **"ALTERNATIVE".** In addition, the Bidder shall submit copies of the bid in the number specified in the BDS, and clearly mark each of them **"COPY."** In the event of any discrepancy between the original and the copies, the original shall prevail. In case of e-submission of bid, the Bidder shall submit his bid electronically in PDF or web forms files as specified in ITB Clause 21.1(b).
	20.2 The original and all copies of the bid shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Bidder. This authorization shall consist of a written confirmation as **specified in the BDS** and shall be attached to the bid. The name and position held by each person signing the authorization must be typed or printed below the signature. All pages of the bid, except for un amended printed literature, shall be signed or initialed by the person signing the bid.
	20.3 Any amendments such as interlineations, erasures, or overwriting shall be valid only if they are signed or initialed by the person signing the bid.
D. Submission and Opening of Bids	
21. Sealing and Marking of Bids	21.1 Bidders may always submit their bids by mail or by hand or by courier. When so **specified in the BDS**, bidders shall have the option of submitting their bids electronically. Procedures for submission, sealing and marking are as follows: (a) Bidders submitting bids by mail, by hand or by courier shall enclose the original of the Technical Bid, and the original of

the Price Bid and each copy of the Technical Bid and Price Bid, including alternative bids, if permitted in accordance with ITB 13, in separate sealed envelopes, duly marking the envelopes as **"ORIGINAL TECHNICAL BID", "ORIGINAL – PRICE BID", "ALTERNATIVE" and "COPY No. – TECHNICAL BID" and "COPY NO. PRICE BID"** These envelopes containing the original and the copies shall then be enclosed in one single envelope.

(b) Bidders submitting Bids electronically shall follow the electronic bid submission procedure specified in this clause.

i. The bidder is required to register in the e-GP system https://www.bolpatra.gov.np/egp following the procedure specified in e-GP guideline.

ii. Interested bidders may either purchase the bidding document from the Employer's office as specified in the Invitation for Bid (IFB) or bidders may download the IFB and bidding document from e-GP system.

iii. The registered bidders need to maintain their profile data required during preparation of bids.

iv. In order to submit their bids the cost of the bidding document can be deposited as specified in IFB. In addition, electronic scanned copy (.pdf format) of the bank deposit voucher/cash receipt should also be submitted along with the technical bid.

v. The bidder can prepare their technical and price bids using data and documents maintained in bidder's profile and forms/format provided in bidding document by Employer. The bidder may submit bids as a single entity or as a joint venture. The bidder submitting bid in joint venture shall have to upload joint venture agreement along with partner(s) Bolpatra ID provided during bidder's registration.

vi. Bidders (all partners in case of JV) should update their profile data and documents required during preparation and submission of their technical bids.

vii. In case of bid submission in JV, the consent of the partners shall be obtained through the confirmation link sent to the registered email address and the partners shall have to acknowledge their confirmation.

The required forms and documents shall be part of technical bids.

No.	Document	Requirement	Remarks
1.	Letter of Technical Bid	Mandatory	PDF
2.	Bid Security/Bank Guarantee	Mandatory	PDF
3.	Company registration	Mandatory	PDF
4.	VAT registration	Mandatory for domestic bidders	PDF
5.	Business Registration	Mandatory	PDF

	Certificate		
6.	Tax clearances certificate or evidence of tax return submission	Mandatory for domestic bidders	PDF
7.	Power of Attorney of Bid signatory	Mandatory	PDF
8.	Bank Voucher for cost of bid document	Mandatory	PDF
9.	Joint venture agreement	Mandatory in case of JV Bids Only	PDF
10.	Qualification Documents	Mandatory	Using profile data(financial details, contract details etc.) and Technical Proposal
11.	Additional documents specified in ITB 11.2 (h)	If applicable	PDF

The required forms and documents shall be part of price bids.

No.	Document	Requirement	Remarks
1.	Letter of Price Bid	Mandatory	PDF
2.	Completed Bill of Quantities (BoQ)	Mandatory	Online Forms
3.	Price Adjustment Table	If applicable	Online Forms
4.	Additional Documents specified in ITB 11.3 (d)	If applicable	PDF

Note: The documents specified as "Mandatory" should be included in e-submission and non-submission of the documents shall be considered as non-responsive bid. .

viii. After providing all the details and documents, two separate bid response documents i.e technical bids and price bids will be generated from the system. Bidders are advised to download and verify the response documents prior to bid submission.

ix. For verifying the authentic user, the system will send one time password (OTP) in the registered e-mail address of the bidder. System will validate the OTP and allow bidder to submit their bid.

x. Electronically submitted bids can be modified and/or withdrawn through system. The bidder may modify their bids multiple times online within bid submission date and time specified in e-GP system. Once a Bid is withdrawn, bidder won't be able to submit another bid response for the same bid.

xi. The Bidder / Bid shall meet the following requirements and conditions for e-submission of bids;

aa) The e-submitted bids must be readable through PDF reader.

bb) The facility for submission of bid electronically through e-submission is to promote transparency, non-discrimination, equality of access, and open competition in the bidding process. The Bidders are fully responsible to use the e-submission facility properly in e-GP system as per specified

	procedures and in no case the Employer shall be held liable for Bidder's inability to use this facility. cc) When a bidder submits electronic bid through the PPMO e-GP portal, it is assumed that the bidder has prepared the bid by studying and examining the complete set of the Bidding documents including specifications, drawings and conditions of contract. 21.2. The inner and outer envelopes shall: (aa) bear the name and address of the Bidder; (bb) be addressed to the Employer as provided in BDS 22.1; (cc) bear the specific identification of this bidding process indicated in BDS 1.1; and 21.3 The outer envelope and the inner envelope containing Technical Proposal shall bear a warning not to open before the time and date for the opening of Technical Bid in accordance with ITB 25.1. 21.4 The inner envelope containing the Price Bid shall bear a warning not to open until advised by the Employer in accordance with ITB 25.7 21.5 If all envelopes are not sealed and marked as required, the Employer will assume no responsibility for the misplacement or premature opening of the bid.
22. Deadline for Submission of Bids	22.1 Bids must be received by the Employer at the address and no later than the date and time indicated **in the BDS**. In case of e-submission, the standard time for e-submission is Nepal Standard Time as set out in the server. The e-procurement system will accept the e-submission of bid from the date of publishing of notice and will automatically not allow the e-submission of bid after the deadline for submission of bid.
	22.2 The Employer may, at its discretion, extend the deadline for the submission of bids by amending the Bidding Document in accordance with ITB 8, in which case all rights and obligations of the Employer and Bidders previously subject to the deadline shall thereafter be subject to the deadline as extended.
23. Late Bids	23.1 The Employer shall not consider any bid that arrives after the deadline for submission of bids, in accordance with ITB 22. Any bid received by the Employer after the deadline for submission of bids shall be declared late, rejected, and returned unopened to the Bidder.
24. Withdrawal, and Modification of Bids	24.1 A Bidder may withdraw, or modify its bid- Technical or Price - after it has been submitted either in hard copy or by e-submission. Once a Bid is withdrawn, bidder shall not be able to submit another bid for this bidding process. Procedures for withdrawal or modification of submitted bids are as follows: (i) Bids submitted in Hard Copy GoN Funded: a) Bidders may withdraw or modify its bids by sending a written notice in a sealed envelope, duly signed by an authorized representative,

	and shall include a copy of the authorization in accordance with ITB 20.2. The corresponding modification of the bid must accompany the respective written notice. All notices must be: (aa)prepared and submitted in accordance with ITB 20 and ITB 21,and in addition, the respective envelopes shall be clearly marked "**WITHDRAWAL", "MODIFICATION;"** and (bb) received by the Employer twenty four hour prior to the deadline prescribed for submission of bids, in accordance with ITB 22. DP Funded: A Bidder may withdraw or modify its Bid – Technical or Price – after it has been submitted by sending a written notice, duly signed by an authorized representative, and shall include a copy of the authorization in accordance with ITB 20.2, (except that withdrawal notices do not require copies). The corresponding modification of the Bid must accompany the respective written notice. All notices must be i) prepared and submitted in accordance with ITB 20 and ITB 21 (except that withdrawal notices do not require copies), and in addition, the respective envelopes shall be clearly marked "WITHDRAWAL," and "MODIFICATION;" and ii) received by the Employer prior to the deadline prescribed for submission of Bids, in accordance with ITB 22. ii) E-submitted bids. a) Bidder may submit modification or withdrawal prior to the deadline prescribed for submission of bids through e-GP system by using the forms and instructions provided by the system.
	24.2 Bids requested to be withdrawn in accordance with ITB 24.1 shall not be opened. In case of hard copy submission, the Bid will be returned unopened to the Bidders.
	24.3 The following provisions apply for withdrawal or modification of the Bids: GoN Funded: (i) In case of bids submitted in hard copy no bid shall be withdrawn or modified in the interval between 24 hours prior to the deadline for submission of bids and the expiration of the period of bid validity specified by the Bidder on the Letter of Bid or any extension thereof. (ii) In case of e-submitted bids no bids shall be withdrawn or modified in the interval between deadline for submission of bids and the expiration of the period of bid validity specified by the Bidder on the Letter of Technical Bid and Price Bid or any extension thereof. DP Funded: No Bid may be withdrawn or modified in the interval between the deadline for submission of Bids and the expiration of the period of bid validity specified by the Bidder on the Letters of Technical Bid and Price Bid or any extension thereof.
	24.4 Bidder may submit request for withdrawal or modification only one time except electronically submitted bid.

	24.5 In case of hard copy bid, no bid may be withdrawn if the bid has already been modified.
	24.6 Request for withdrawal or modification must be made through the same medium of submission. Request for withdrawal or modifications through different medium shall not be considered.
25. Bid Opening	25.1 The Employer shall open the Technical Bids in public at the address, on the date and time **specified in the BDS** in the presence of Bidders` designated representatives who choose to attend. The Price Bids will remain unopened and will be held in custody of the Employer until the specified time of their opening. If the Technical Bid and Price Bid are submitted together in one envelope, the Employer shall reject the entire Bid.
	25.2 The Employer shall download the e-submitted Technical Bid. The e-GP system allows the Employer to download the e-submitted technical bid only after bid opening date and time after login simultaneously by at least two members of the Bid Opening Committee.
	25.3 Electronically submitted Technical Bid shall be opened at first in the same time and date as specified above. Electronic Bids shall be opened one by one and read out. The e-submitted technical bids must be readable through open standards interfaces. Unreadable and or partially submitted bid files shall be considered incomplete.
	25.4 Thereafter, envelopes marked "WITHDRAWAL" shall be opened and read out and the envelope with the corresponding Bid shall not be opened, but returned to the Bidder. No bid withdrawal shall be Permitted unless the corresponding withdrawal notice contains a valid authorization to request the withdrawal and is read out at bid opening. Next, envelopes marked "MODIFICATION" shall be opened and read out with the corresponding bid. No Technical Bid and/or Price Bid modification shall be permitted unless the corresponding modification notice contains a valid authorization to request the modification and is read out and recorded at bid opening. Only the Technical Bid, both Original as well as Modification, are to be opened, read out, and recorded at the opening. Price Bids, both Original and Modification, will remain unopened in accordance with ITB 25.1.
	25.5 All other envelopes holding the Technical Bid shall be opened one at a time, reading out: the name of the Bidder; whether there is a modification; the presence of a bid security and any other details as the Employer may consider appropriate. Only Technical Bids read out and recorded at bid opening shall be considered for evaluation. No bid shall be rejected at opening of Technical Bids except for late bids, in accordance with ITB 23.1.
	25.6The Employer shall prepare a record of the opening of Technical Bids that

	shall include, as a minimum: the name of the Bidder and whether there is a withdrawal, or modification; and the presence or absence of a bid security. The Bidders' representatives who are present shall be requested to sign the record. The omission of a Bidder's signature on the record shall not invalidate the contents and effect of the record.
	25.7 At the end of the evaluation of the Technical Bids, the Employer will invite bidders who have submitted substantially responsive Technical Bids and who have been determined as being qualified for award to attend the opening of the Price Bids. The date, time, and location of the opening of Price Bids will be advised in writing by the Employer. Bidders shall be given at least 7 days notice for the opening of Price Bids.
	25.8 The Employer will notify Bidders in writing who have been rejected on the grounds of their Technical Bids being substantially nonresponsive to the requirements of the Bidding Document and return their Price Bids unopened.
	25.9 The Employer shall conduct the opening of Price Bids of all Bidders who submitted substantially responsive Technical Bids, in the presence of Bidders` representatives who choose to attend at the address, on the date, and time specified by the Employer. The Bidder's representatives who are present shall be requested to sign a register evidencing their attendance.
	25.10 All envelopes containing Price Bids shall be opened one at a time and the following read out and recorded: (a) the name of the Bidder; (b) whether there is a modification; (c) the Bid Prices, including any discounts and alternative offers; and (d) any other details as the Employer may consider appropriate. Only Price Bids, discounts, modifications, and alternative offers read out and recorded during the opening of Price Bids shall be considered for evaluation. No Bid shall be rejected at the opening of Price Bids.
	25.11 The Employer shall prepare a record of the opening of Price Bids that shall include, as a minimum, the name of the Bidder, the Bid Price (per lot if applicable), any discounts, modifications and alternative offers. The Bidders' representatives who are present shall be requested to sign the record. The omission of a Bidder's signature on the record shall not invalidate the contents and effect of the record.
E. Evaluation and Comparison of Bids	
26. Confidentiality	26.1 Information relating to the examination, evaluation, comparison, and post-qualification of bids and recommendation of Contract award, shall not be disclosed to Bidders or any other persons not officially concerned with such process until information on Contract award is communicated to all

	Bidders.
	26.2 Any attempt by a Bidder to influence the Employer in the evaluation of the bids or Contract award decisions may result in the rejection of its bid.
	26.3 Notwithstanding ITB 26.2, from the time of bid opening to the time of Contract award, if any Bidder wishes to contact the Employer on any matter related to the bidding process, it may do so in writing.
27. Clarification of Bids	27.1 To assist in the examination, evaluation, and comparison of the Technical and Price Bids, the Employer may, at its discretion, ask any Bidder for a clarification of its Bid. Any clarification submitted by a Bidder that is not in response to a request by the Employer shall not be considered. The Employer's request for clarification and the response shall be in writing. No change in the substance of the Technical Bid or prices in the Price Bid shall be sought, offered, or permitted, except to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Price Bids, in accordance with ITB 33. In case of e-submission of bid, upon notification from the employer, the bidder shall also submit the original of documents comprising the Technical and Price Bid as per ITB 11.2 and ITB 11.3 for verification of submitted documents for acceptance of the e-submitted bid.
	27.2 If a Bidder does not provide clarifications of its Bid by the date and time set in the Employer's request for clarification, its Bid may be rejected.
28. Deviations, Reservations, and Omissions	28.1 During the evaluation of bids, the following definitions apply: (a) "Deviation" is a departure from the requirements specified in the Bidding Document; (b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Document; and (c) "Omission" is the failure to submit part or all of the information or documentation required in the Bidding Document.
29. Examination of Technical Bid	29.1The Employer shall examine the Technical Bid to confirm that all documents and technical documentation requested in ITB 11.2 have been provided, and to determine the completeness of each document submitted.
	29.2 The Employer shall confirm that the following documents and information have been provided in the Technical Bid. If any of these documents or information is missing, the offer shall be rejected. (a) Letter of Technical Bid; (b) written confirmation of authorization to commit the Bidder; (c) Bid Security; and (d) Technical Proposal in accordance with ITB 16

30. Determination of Responsiveness of Technical Bid	30.1 The Employer's determination of a Bid's responsiveness is to be based on the contents of the bid itself, as defined in ITB11.2.
	30.2 A substantially responsive Technical Bid is one that meets the requirements of the Bidding Document without material deviation, reservation, or omission. A material deviation, reservation, or omission is one that, (a) if accepted, would: (i) affect in any substantial way the scope, quality, or performance of the Works specified in the Contract; or (ii) limit in any substantial way, inconsistent with the Bidding Document, the Employer's rights or the Bidder's obligations under the proposed Contract; or (b) if rectified, would unfairly affect the competitive position of other Bidders presenting substantially responsive bids.
	30.3 The Employer shall examine the technical aspects of the Bid submitted in accordance with ITB 16, Technical Proposal, in particular, to confirm that all requirements of Section VI (Works Requirements) have been met without any material deviation, reservation or omission.
	30.4 If a bid is not substantially responsive to the requirements of the Bidding Document, it shall be rejected by the Employer and may not subsequently be made responsive by correction of the material deviation, reservation, or omission.
	30.5 In case of e-submission bids, the Employer evaluates the bid on the basis of the information in the electronically submitted bid files. If the Bidder cannot substantiate or provide evidence to establish the information provided in e-submitted bid through documents/ clarifications as per ITB Clause 27.1, the bid shall not be considered for further evaluation.
31. Nonconformities Errors, and Omissions	31.1 Provided that a bid is substantially responsive, the Employer may waive any non-conformities in the bid that do not constitute a material deviation, reservation, or omission.
	31.2 Provided that a Technical Bid is substantially responsive, the Employer may request that the Bidder submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities in the Technical Bid related to documentation requirements. Requesting information or documentation on such nonconformities shall not be related to any aspect of the Price Bid. Failure of the Bidder to comply with the request may result in the rejection of its bid.
	31.3 Provided that a Technical Bid is substantially responsive, the Employer shall rectify quantifiable nonmaterial nonconformities

	related to the Bid Price. To this effect, the Bid Price shall be adjusted, for comparison purposes only, to reflect the price of a missing or non-conforming item or component. The adjustment shall be made using the methods indicated in Section III (Evaluation and Qualification Criteria).
	31.4 If the monetary value of such non-conformities is found to be more than fifteen percent of the Bid Price of the bidder pursuant to ITB **31.3**, such bid shall be considered nonresponsive and shall not be involved in evaluation.
32 Qualification of the Bidder	32.1 The Employer shall determine to its satisfaction during the evaluation of Technical Bids whether Biddersmeet the qualifying criteria specified in Section III (Evaluation and Qualification Criteria).
	32.2 The determination shall be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to ITB 17.1.
	32.3 An affirmative determination shall be a prerequisite for the opening and evaluation of a Bidder's Price Bid. A negative determination shall result into the disqualification of the Bid, in which event the Employer shall return the unopened Price Bid to the Bidder.
33. Correction of Arithmetical Errors	33.1 During the evaluation of Price Bids, the Employer shall correct arithmetical errors on the following basis: (a) only for unit price Contracts, if there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected, unless in the opinion of the Employer there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected; (b) if there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; (c) If there is a discrepancy between the bid price in the Summary of Bill of Quantities and the bid amount in item (c) of the Letter of Price Bid, the bid price in the Summary of Bill of Quantities will prevail and the bid amount in item (c) of the Letter of Price Bid will be corrected. (d) if there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a), (b) and (c) above.
	33.2 If the Bidder that submitted the lowest evaluated bid does not accept the correction of errors, its bid shall be disqualified and its bid security shall be forfeited.
34 Subcontractors	34.1 In case of Prequalification, the Bidder's Bid shall name the same subcontractor as submitted in the prequalification application and

	approved by the Employer. In case of Post-qualification, the Employer may permit subcontracting for certain specialized works as indicated in Section III When subcontracting is permitted by the Employer, the sub-contractor shall meet the qualifications criteria as indicated in section III. Sub-contractors' qualification and experience will not be considered for evaluation of the Bidder. The Bidder on its own (without taking into account the qualification and experience of the sub-contractor) should meet the qualification criteria. Bidders may propose subcontracting up to the percentage of total value of contracts or the volume of works as **specified in the BDS.**
35. Evaluation of Price Bids	35.1 The Employer shall use the criteria and methodologies listed in this Clause. No other evaluation criteria or methodologies shall be permitted.
	35.2 To evaluate a Price Bid, the Employer shall consider the following: (a) the bid price, excluding Value Added Tax , Provisional Sums, and the provision, if any, for contingencies in the Summary Bill of Quantities**,** for Unit Rate Contracts, or Schedule of Prices for lump sum Contracts, but including Day work items, where priced competitively; (b) price adjustment for correction of arithmetic errors in accordance with ITB 33.1; (c) price adjustment due to discounts offered in accordance with ITB 14.4; (d) adjustment for nonconformities in accordance with ITB 31.3; (e) application of all the evaluation factors indicated in Section III (Evaluation and Qualification Criteria);
	35.3 The estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract, shall not be taken into account in bid evaluation.
	35.4 If this Bidding Document allows Bidders to quote separate prices for different Contracts, and to award multiple Contracts to a single Bidder, the methodology to determine the lowest evaluated price of the Contract combinations, including any discounts offered in the Letter of Price Bid, is specified in Section III (Evaluation and Qualification Criteria).

	35.5 if the bid for an Unit Rate Contract, which results in the lowest Evaluated Bid Price is seriously unbalanced or front loaded in the opinion of the Employer, the Employer may require the Bidder to produce detailed price analysis for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analysis, taking into consideration the schedule of estimated Contract payments, the Employer may require that the amount of the performance security be increased at the expense of the Bidder as **mentioned in BDS** to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.
	35.6 In case of e-submission bids, the Employer evaluates the bid on the basis of the information in the electronically submitted bid files. If the Bidder cannot substantiate or provide evidence to establish the information provided in e-submitted bid through documents/ clarifications as per ITB Clause 27.1, the bid shall not be considered for further evaluation.
36. Comparison of Bids	36.1 The Employer shall compare all substantially responsive bids in accordance with ITB 35.2 to determine the lowest evaluated bid.
37. Employer's Right to Accept Any Bid, and to Reject Any or All Bids	37.1 The Employer reserves the right to accept or reject any bid, and to annul the bidding process and reject all Bids at any time prior to contract award, without thereby incurring any liability to Bidders. In case of annulment, all Bids submitted and specifically, bid securities, shall be promptly returned to the Bidders.
F. Award of Contract	
38. Award Criteria	38.1 The Employer shall award the Contract to the Bidder whose offer has been determined to be the lowest evaluated bid and is substantially responsive to the Bidding Document, provided further that the Bidder is determined to be qualified to perform the Contract satisfactorily.
39. Letter of Intent to Award the Contract/Notification of Award	39.1 The Employer shall notify the concerned Bidder whose bid has been selected in accordance with ITB 38.1 within seven days of the selection of the bid, in writing that the Employer has intention to accept its bid and the information regarding the name, address and amount of selected bidder shall be given to all other bidders who submitted the bid.
	39.2 If no bidder submits an application pursuant to ITB 42 within a period of seven days of the notice provided under ITB 39.1, the Employer shall, accept the bid selected in accordance with ITB 38.1 and Letter of Acceptance shall be communicated to the selected bidder prior to the expiration of period of Bid validity, to furnish the performance security and sign the contract within fifteen days.
40. Performance	40.1 Within Fifteen (15) days of the receipt of Letter of Acceptance from the

Security	Employer, the successful Bidder shall furnish the performance security in accordance with the Conditions of Contract, subject to ITB 35.5, as specified below from A class Commercial Bank using Sample Form for the Performance Security included in Section X (Contract Forms), or another form acceptable to the Employer. The performance security issued by any foreign Bank outside Nepal must be counter guaranteed by an "A" class commercial Bank in Nepal. i) If bid price of the bidder selected for acceptance is up to 15 (fifteen) percent below the approved cost estimate, the performance security amount shall be 5 (five) percent of the bid price. ii) For the bid price of the bidder selected for acceptance is more than 15 (fifteen) percent below of the cost estimate, the performance security amount shall be determined as follows: **Performance Security Amount = [(0.85 x Cost Estimate –Bid Price) x 0.5] + 5% of Bid Price.** The Bid Price and Cost Estimate shall be inclusive of Value Added Tax.
	40.2 Failure of the successful Bidder to submit the above-mentioned Performance Security or to sign the Contract Agreement shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security. In that event the Employer may award the Contract to the next lowest evaluated Bidder whose offer is substantially responsive and is determined by the Employer to be qualified to perform the Contract satisfactorily. The process shall be repeated according to ITB 39.
41 Signing of Contract	41.1 The Employer and the successful Bidder shall sign the Contract Agreement within the period as stated ITB 40.1.
	41.2 At the same time, the Employer shall affix a public notice on the result of the award on its notice board and make arrangement for causing such notice to be affixed on the notice board also of the ***District Development Committee, District Administration Office and District Treasury and Controller Office.*** The Employer may make arrangements to post the notice into its website, if it has; and if it does not have, into the website of the Public Procurement Monitoring Office, identifying the bid and lot numbers and the following information: (i) the result of evaluation of bid; (ii) date of publication of notice inviting bids; (iii) name of newspaper; (iv) reference number of notice; (v) item of procurement; (vi) name and address of bidder making contract and (viii) contract price
	41.3 Within thirty (30) days from the date of issuance of notification pursuant to ITB 39.1 unsuccessful bidders may request in writing to the Employer for a debriefing seeking explanations on the grounds on which their bids were not selected. The Employer shall promptly respond in writing to any unsuccessful Bidder who, requests for debriefing.
	41.4 If the bidder whose bid has been accepted fails to sign the contract as stated ITB 40.1, the Public Procurement Monitoring Office shall blacklist the bidder on recommendation of the Public Entity.
42. Complaint and	42.1 If a Bidder is dissatisfied with the Procurement proceedings or

Review	thedecision made by the Employer in opening of the price bid or the intention to award the Contract, it may file an application to the Chief of the Public Entity or Public Procurement Monitoring Office or office established as per Clause 145(a) of the Public Procurement Regulation within Seven (7) days of providing the notice under ITB 25.8 and ITB 39.1 by the Public Entity, for review of the proceedings stating the factual and legal grounds.
	42.2 Late application filed after the deadline pursuant to ITB 42.1 shall not be processed.
	42.3 The chief of Public Entity shall, within five (5) days after receiving the application, give its decision with reasons, in writing pursuant to ITB 42.1: (a) whether to suspend the procurement proceeding and indicate the procedure to be adopted for further proceedings; or (b) to reject the application. The decision of the chief of Public Entity shall be final for the Bid amount up to the value as stated in 42.4.
	42.4 If the Bidder is not satisfied with the decision of the Public Entity in accordance with ITB 42.3, is not given within five (5) days of receipt of application pursuant to ITB 42.1, it can, within seven (7) days of receipt of such decision, file an application to the Review Committee of the GoN, stating the reason of its disagreement on the decision of the chief of Public Entity and furnishing the relevant documents, provided that its Bid amount is more than Rupees Twenty Million (NRs. 20,000,000). The application may be sent by hand, by post, by courier, or by electronic media at the risk of the Bidder itself.
	42.5 Late application filed after the deadline pursuant to ITB 42.4 shall not be processed.
	42.6 Within three (3) days of the receipt of application from the Bidder, pursuant to ITB 42.4, the Review Committee shall notify the concerning Public Entity to furnish its procurement proceedings, pursuant to ITB 42.3.
	42.7 Within three (3) days of receipt of the notification pursuant to ITB 42.6, the Public Entity shall furnish the copy of the related documents to the Review Committee.
	42.8 The Review Committee, after inquiring from the Bidder and the Public Entity, if needed, shall give its decision within one (1) month of the receipt of the application filed by the Bidder, pursuant to ITB 42.4.
	42.9 The Bidder, filing application pursuant to ITB 42.4, shall have to furnish a cash amount or Bank guarantee from "A" class commercial bank equivalent to zero point one five percent (0.15%) of its quoted Bid amount with the validity period of at least ninety (90) days from the date of the filing of application pursuant to ITB 42.4.

	42.10 If the claim made by the Bidder pursuant to ITB 42.4 is justified, the Review Committee shall have to return the security deposit to the applicant, pursuant to ITB 42.9, within seven (7) days of such decision made.

SECTION-II

Bid Data Sheet

A. General

ITB 1.1	The number of the Invitation for Bids is : NRA/CLPIU/GMaLI/MAK/W/PDRF/01
ITB 1.1	The Employer is : District Level Project Implementation Unit (DLPIU/GMaLI), Makwanpur
ITB 1.1	The number and identification of lots comprising this bidding process is: NRA/CLPIU/GMaLI/MAK/W/PDRF/01
ITB 2.1	The name of the Project is: Upgrading of Bhimphedi-Kogate-Ipa-Deurali Road, 23.640 Km The Development Partner(DP) is : NA Implementing Agency: NA
ITB 4.1(a)	Maximum number of partner in a joint venture shall be :3

B. Bidding Document

ITB 7.1	For clarification purposes only, the Employer's address is: Attention: Som raj Timilsena admin Address: Hetauda Makwanpur Telephone: 9855030632 Facsimile number: Electronic mail address: dlpiumakwanpur@gmail.com
ITB 7.4	A site visit shall not be organized by the Employer.
ITB 7.4	A pre bid meeting shall take place.
	Date and Time:17-08-2018 13:00
	Address :District Level Project Implementation Unit (DLPIU/GMaLI), Makwanpur Hetauda Makwanpur Nepal
ITB 7.5	Time for request: Requests for clarification should be received by the Employer no later than 15 days prior to the deadline for submission of bids.

C. Preparation of Bids

ITB 10.1	The language of the bid is: English / Nepali
ITB 11.2 (h)	The Bidder shall submit with its Technical Bid the following additional documents:

	SL No	Document Name
	1	Firm/Company Registration Certificate
	2	VAT and PAN Registration Certificates
	3	Tax Clearance Certificate for FY 2074/75
	4	Declaration Letter
ITB 11.3 (b)	In accordance with ITB 12 and ITB 14, the following schedules shall be submitted with the bid, including the priced Bill of Quantities for Unit Rate Contracts and Schedule of Prices for lump sum contracts:	
	SL No	Document Name
	1	Table of Price Adjustment.
ITB 11.3 (d)	The Bidder shall submit with its Price Bid the following additional documents :	
	SL No	Document Name
	1	Table of Price Adjustment.
ITB 13.1	Alternative bids shall not be permitted.	
ITB 13.2	Alternative times for completion shall not be permitted.	
ITB 13.4	Alternative technical solutions shall not be permitted for the following parts of the Works	
ITB 14.6	The prices quoted by the Bidder shall be subject to adjustment during the performance of the Contract.	
ITB 18.1	The bid validity period shall be 120 days.	
ITB 19.1	The Bidder shall furnish a bid security of 11000000.00 NPR from "A" class commercial bank. Which shall be valid for 30 days beyond the validity period of the bid.	
ITB 19.2(b)	Bank Name:	Nepal Bank Ltd.
	Branch Name:	Hetauda City Office
	Bank Address:	Hetauda, 0, Makwanpur, Hetauda
	Office Name:	District Treasury Office, Makwanpur
	Account Number:	02502000000003000070
	Office Code:	31-301-02
ITB 20.1	In addition to the original of the bid, the number of copy/ies is/are:	
	SL No	Document Name
	1	Not Applicable
ITB 21.1	0	
ITB 20.2	The written confirmation of authorization to sign on behalf of the Bidder shall indicate: (a) The name and description of the documentation required to demonstrate the authority of the signatory to sign the Bid such as a Power of Attorney; and (b) In the case of Bids submitted by an existing or intended JV, an undertaking signed by all parties (i) stating that all parties shall be jointly and severally liable, and (ii) nominating a Representative who shall have the authority to conduct all business for and on behalf of any and all the parties of the JV during the bidding process and, in the event the JV is awarded the Contract, during contract execution.	

ITB 21.1	0

D. Submission and Opening of Bids

ITB 21.1	Bidders shall have the option of submitting their bids by electronic only.
ITB 22.1	For bid submission purposes only, the Employer's address is : Attention : District Level Project Implementation Unit (DLPIU/GMaLI), Makwanpur Address : District Level Project Implementation Unit (DLPIU/GMaLI), Makwanpur Hetauda Makwanpur Nepal The deadline for bid submission is : 03-09-2018 12:00
ITB 25.1	The Technical Bid opening shall take place at : Address : District Level Project Implementation Unit (DLPIU/GMaLI), Makwanpur Hetauda Makwanpur Nepal Date : 03-09-2018 13:00

E. Evaluation and Comparison of Bids

ITB 34.1	Sub-contracting for this procurement is: Not Applicable
ITB 35.5	The amount of the performance security be increased by 8 percent of the quoted bid price.

SECTION-III

Evaluation and Qualification Criteria

1. Evaluation Criteria

1.1 Adequacy of Technical Proposal

Sl. No.	Criteria Title	Criteria Description
1	Adequacy of Technical Proposal	Evaluation of the Bidder's Technical Proposal will include an assessment of the Bidder's technical capacity, to mobilize key equipment and personnel for the contract consistent with its proposal regarding work methods, scheduling, and material sourcing in sufficient detail and fully in accordance with the requirements stipulated in Section VI (Works Requirements).

1.5 Quantifiable Non-conformities and Omissions

Sl. No.	Criteria Title	Criteria Description
1	Quantifiable Non-conformities and Omissions	Subject to ITB 14.2 and ITB 35.2, the evaluated cost of quantifiable nonconformities including omissions, is determined as follows: [Insert in bidding document: Pursuant to ITB 31.3, the cost of all quantifiable nonmaterial nonconformities shall be evaluated. The Employer will make its own assessment of the cost of any nonmaterial nonconformities and omissions for the purpose of ensuring fair comparison of bids.]

1.6 Multiple Contracts

Sl. No.	Criteria Title	Criteria Description
1	Multiple Contracts	Pursuant to Sub-Clause 35.4 of the Instructions to Bidders, if Works are grouped in multiple contracts, evaluation will be as follows: Works are grouped in multiple contracts and pursuant to Sub-Clause 35.4 of the Instructions to Bidders, the Employer will evaluate and compare Bids on the basis of a contract, or a combination of contracts, or as a total of contracts in order to arrive at the least cost combination for the Employer by taking into account discounts offered by Bidders in case of award of multiple contracts. If a bidder submits several successful (lowest evaluated substantially responsive) bids, the evaluation will also include an assessment of the Bidder's capacity to meet the aggregated requirements regarding: • Specific Construction Experience • Average Annual Construction Turnover • Financial Resources, Equipment to be allocated, and • Personnel to be fielded.

2. Qualifications Criteria

It is the legal entity or entities comprising the Bidder, and not the Bidder’s parent companies, subsidiaries, or affiliates, that must satisfy the qualification criteria described below.

2.1 Eligibility

Sl. No.	Criteria Title	Criteria Description
1	Nationality	Nationality in accordance with ITB Subclause 4.2. Single entity must meet requirements. In case of joint ventures, each partner must meet requirement. Document required: Forms ELI 1; ELI 2 with attachments

Sl. No.	Criteria Title	Criteria Description
2	Conflict of Interest	No conflicts of interest in accordance with ITB Sub- Clause 4.3. For Single Entity : Must meet requirement For joint Venture : All partners combined -> existing or intended JV must meet requirement. Each partner -> Must meet requirement. One partner -> Not applicable. Documents Submission Requirements : Letter of Bid
3	United Nations Eligibility	Not having been declared ineligible based on a United Nations resolution or Employer's country law, as described in ITB Sub-Clause 4.8. For Single Entity : Must meet requirement For joint Venture : All combined partner -> existing or intended JV must meet requirement. each partner -> must meet requirement. One partner -> not applicable. Documents Submission Requirements : Letter of Bid
4	Government-Owned Enterprise	Bidder required to meet conditions of ITB Sub-Clause 4.5. For Single Entity : Must meet requirement For joint Venture : All combined partner -> existing or intended JV must meet requirement. each partner -> must meet requirement. One partner -> not applicable. Documents Submission Requirements : Forms ELI - 1, ELI - 2, with attachments
5	Other Eligibility : Firm Registration Certificate	Firm Registration Certificate For Single Entity : Must meet requirement For joint Venture : Each partner must meet requirement. For all partner combined and one partner -> not applicable. Documents Submission Requirements : Document attachment.
6	Other Eligibility : Business Registration Certificate	Business Registration Certificate For Single Entity : Must meet requirement For joint Venture : Each partner-> must meet requirement.For all partner combined and one partner -> not applicable. Documents Submission Requirements : Document attachment.
7	Other Eligibility : Tax Clearance Certificate/Tax return submission evidence/evidence of time extension for the F/Y 074/75 (Only for domestic bidders)	Tax Clearance Certificate/Tax return submission evidence/evidence of time extension for the F/Y 074/75 (Only for domestic bidders) For Single Entity : Must meet requirement For joint Venture : Each partner-> must meet requirement. For all partner combined and one partner -> not applicable. Documents Submission Requirements : Document attachment.
8	Other Eligibility : VAT and PAN Registration	VAT and PAN Registration(only for domestic bidders) For Single Entity : Must meet requirement For joint Venture : Each partner -> must meet requirement. For all partner combined and one partner -> not applicable. Documents Submission Requirements : Document attachment.
9	Other Eligibility : Additional requirements	Additional requirements For Single Entity : Must meet requirement For joint Venture : Each partner->must meet requirement. For all partner combined and one partner -> not applicable. Documents Submission Requirements : Document attachment.

2.2 Pending Litigation and Arbitration

Sl. No.	Criteria Title	Criteria Description
1	Pending Litigation and Arbitration	All pending litigation shall be treated as resolved against the Bidder and so shall in total not represent more than 50 percent of the Bidder's net worth. Note: (1) The percentage should normally be within the range of 50% to 100% of the Bidder's net worth. For Single Entity : must meet requirement by itself or as partner to past or existing JV For joint Venture :Each partner must meet requirement by itself or as partner to past or existing JV. All partner combined and one partner -> not applicable. Documents Submission Requirements : Form LIT - 1

2.3 Financial Situation

Sl. No.	Criteria Title	Criteria Description
1	Historical Financial Performance	Submission of audited balance sheets and income statements, for the last 10 years to demonstrate the current soundness of the Bidder's financial position. As a minimum, a Bidder's net worth calculated as the difference between total assets and total liabilities should be positive. Note: (1) The financial information provided by a Bidder should be reviewed in its entirety to allow a truly informed judgment, and the pass-fail decision on the financial position of the Bidder should be given on this basis. Balance sheet of the past three to five years period which shall be decided according to the nature of the work. For Single Entity : Must meet requirement For joint Venture : Each partner Must meet requirement. All partner combined and one partner -> not applicable. Documents Submission Requirements : Form FIN - 1 with attachments
2	Average Annual Construction Turnover	Minimum average annual construction turnover of NRs 270,000,000 calculated as total certified payments received for construction contracts in progress or completed, within best three years out of last ten years. Only the net amount shall be calculated after deducting the amount for VAT and such amount shall be adjusted wholesale price index of Nepal Rastra Bank. For Single Entity : Must meet requirement For joint Venture : All combined partner Must meet requirements, Each partner Must meet 25% of the requirement, One partner must meet 40% of the requirements. Documents Submission Requirements : Form FIN -2 Note: (2) The amount stated should normally not be less than 1.5 x V/T, the estimated annual turnover in the subject contract based on a straight-line projection of the Employer's estimated cost (V), over the contract duration (T) in year. Contract duration less than one year shall be considered one year. The multiplier of 1.5 may be reduced up to1 (one) in accordance with the size, nature and complexity of contracts. (3) Usually not less than 25 % (4) Usually not less than 40 %

Sl. No.	Criteria Title	Criteria Description
3	Financial Resources [Note: If the bid evaluation process and the decision for the award of the Contract takes more than one (1) year from the date of bid submission, Bidders shall be asked to resubmit their current contract commitments and latest information on financial resources supported by latest audited accounts or audited financial statements, or if not required by the law of the Bidder's country, other financial statements acceptable to the Employer, and the Bidders' financial capacity shall be reassessed on this basis.]	Using Forms FIN - 3 and FIN - 4 in Section IV (Bidding Forms) the Bidder must demonstrate access to, or availability of, financial resources such as liquid assets, unencumbered real assets, lines of credit, and other financial means, other than any contractual advance payments to meet its current Contract Commitments, plus: The following cash - flow requirement, NRs. 120,000,000 For Single Entity : Must meet requirement For joint Venture : All combined partner Must meet requirements, Each partner Must meet 25% of the requirement, One partner must meet 40% of the requirements. Documents Submission Requirements : Form FIN - 3 and Form FIN - 4 Note: (5) Construction cash flow requirement for a number of months (to the nearest half-month), determined as the total time needed by the Employer to pay a contractor's invoice, allowing for (a) the actual time consumed for construction, from the beginning of the month invoiced, (b) the time needed by the Project Manager to issue the monthly payment certificate, (c) the time needed by the Employer to pay the amount certified, and (d) a contingency period of one month to allow for unforeseen delays. The total period should not exceed six months. The assessment of the monthly amount should be based on a straight-line projection of the estimated cash flow requirement over the particular contract period, neglecting the effect of any advance payment and retention monies, but including contingency allowances in the estimated contract cost. (6) Usually not less than 25 % (7) Usually not less than 40 %

2.4 Construction Experience

Sl. No.	Criteria Title	Criteria Description
1	General Construction Experience	Experience under construction contracts in the role of contractor, subcontractor, or management contractor for at least the last 5 years prior to the applications submission deadline. For Single Entity : Must meet requirement For joint Venture : Each Partner Must meet requirement. All partner combined and one partner not applicable. Documents Submission Requirements : Form EXP - 1 Note: (1) Insert number of years in words and figures. The time period is normally 5 years or more, but may be reduced to not less than 3 years, according to the nature of works.

Sl. No.	Criteria Title	Criteria Description
2	Contracts of Similar Size and Nature	Participation as Prime contractor, management contractor, or subcontractor, in at least 2 Contracts in Road Works within the last ten (10) years, each with a value of at least NRs 300,000,000 that have been successfully or are substantially completed and that are similar to the proposed works. The similarity shall be based on the physical size, complexity, methods, technology or other characteristics as described in Section VI, Works Requirements. Only the net amount worked out after deducting the amount for VAT shall be computed and such amount shall be adjusted to the present value by applying wholesale price index of Nepal Rastra Bank. For Single Entity : Must meet requirement For joint Venture : All partners combined, must meet requirement. Each partner and one partner not applicable. Documents Submission Requirements : Form EXP - 2(a) Note: (2) Insert number of contracts, the range should be one to two, depending on the size and complexity of the subject contract, the exposure of the risk to the Employer by contractors default. (3) Insert amount in Nepalese rupees, which is usually 80% of the estimated value of the subject contract.
3	Construction Experience in Key Activities	For the above or other contracts executed during the period stipulated in 2.4.2(a) above, a minimum construction experience in the following key activities : Sub base work : 20000 Cum Bituminuous Works :100 MT For Single Entity : Must meet requirement For joint Venture : Each Partner and All partner combined must meet all requirements. One partner not applicable. Documents Submission Requirements : Form EXP â€“ 2(b)

2.5 Personnel Requirements

Sl. No.	Position	Required No	Academic Qualification	Total Work Experience (in years)	Experience in Similar Work(in years)
1	Contract Manager	1	ME in civil Engineering	5	3
2	Civil Engineer	1	BE in civil Engineering	5	3
3	Sub Engineer	2	Diploma in civil Engineering	5	3
4	Lab Technician	1	Intermediate Level with Lab Training	3	2

2.6 Equipment Requirements

Sl. No.	Equipment Type Characteristics	Minimum number required
1	Excavator (with Breaker)	2
2	Loader /Backhoe	2
3	Vibrating Roller	1
4	Pneumatic Roller	1
5	Aggregate Distributor	1
6	Bitumen Distributor	1
7	Water Browser	1
8	Air Compressor	1

2.7 Subcontractors

The experience and financial capacity of the sub-contractors shall not be added to those of the Bidder for purposes of qualification of the Bidder.

The sub-contractors proposed shall be fully qualified for their work proposed, and meet the following criteria:

SECTION-IV
Bidding Forms

Letter of Technical Bid

The Bidder must accomplish the Letter of Bid in its letterhead clearly showing the Bidder's complete name and address.

Date: .....

Name of the contract: .....

Invitation for Bid No.: .....

To:……....

We, the undersigned, declare that:

(a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (ITB) Clause 8.

(b) We offer to execute in conformity with the Bidding Documents the following Works:

(c) Our Bid consisting of the Technical Bid and the Price Bid shall be valid for a period of ***[insert validity period as specified in ITB 18.1 of the BDS]*** days from the date fixed for the bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

(d) Our firm, including any subcontractors or suppliers for any part of the Contract, have nationalities from eligible countries in accordance with ITB 4.2.

(e) We are not participating, as a Bidder or as a subcontractor, in more than one Bid in this bidding process in accordance with ITB 4.3(e), other than alternative offers submitted in accordance with ITB 13.

(f) Our firm, its affiliates or subsidiaries, including any Subcontractors or Suppliers for any part of the contract, has not been declared ineligible by DP, under the Employer's countr laws or official regulations or by an act of compliance with a decision of the United Nations Security Council;

(g) We are not a government owned entity/We are a government owned entity but meet the requirements of ITB 4.5;[1]

(h) We declare that, we including any subcontractors or suppliers for any part of the contract do not have any conflict of interest in accordance with ITB 4.3 and we have not been punished for an offense relating to the concerned profession or business.

(i) We declare that we are solely responsible for the authenticity of the documents submitted by us.

(j) We agree to permit the Employer/DP or its representative to inspect our accounts and records and other documents relating to the bid submission and to have them audited by auditors appointed by the Employer.

(k) If our Bid is accepted, we commit to mobilizing key equipment and personnel in accordance with the requirements set forth in Section III (Evaluation and Qualification Criteria) and our technical proposal, or as otherwise agreed with the Employer.

Name: .....

In the capacity of .....

Signed ……...

Duly authorized to sign the Bid for and on behalf of ……

Date ……....

Letter of Price Bid

The Bidder must accomplish the Letter of Bid in its letterhead clearly showing the Bidder's complete name and address.

Date: .....

Name of the contract: .....

Invitation for Bid No.: .....

To:…….....

We, the undersigned, declare that:

(a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (ITB) Clause 8;

(b) We offer to execute in conformity with the Bidding Documents the following Works:

(c) The total price of our Bid, excluding any discounts offered in item (d) below is: NRs. ……..; or when left blank is the Bid Price indicated in the Bill of Quantities[5].

(d) The discounts offered and the methodology for their application are:……..

(e) Our bid shall be valid for a period of ***[insert validity period as specified in ITB 18.1]*** days from the date fixed for the bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

(f) If our bid is accepted, we commit to obtain a performance security in accordance with the Bidding Document;

(g) We have paid, or will pay the following commissions, gratuities, or fees with respect to the bidding process or execution of the Contract:[6]

Name of Recipient	Address	Reason	Amount
.....	.....	.....	.....
.....	.....	.....	.....

[5]Absence of the total price in the Letter of Price Bid or in the Bill of Quantities shall result in rejection of the Bid.

[6] If none has been paid or is to be paid, indicate "None".

(h) We understand that this bid, *together with your written acceptance thereof i*ncluded **i**n your notification of award, shall constitute a binding contract between us, until a formal contract is prepared and executed;

(i) We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive; and

(j) We declare that we are solely responsible for the authenticity of the documents submitted by us.

(k) We agree to permit the Employer/DP or its representative to inspect our accounts and records and other documents relating to the bid submission and to have them audited by auditors appointed by the Employer.

Name: .....

In the capacity of .....

Signed ……...

Duly authorized to sign the Bid for and on behalf of ……

Date ……....

Table of Price Adjustment Data

[To be used if Price Adjustment is applicable as per GCC 53.1]

Code	Index Description	Source of Index*	Base Value and Date	Employer's Proposed Weighting Range (coefficient)	Bidder's Proposed Weighting (coefficient)**
1	2	3	4	5	6
	Non - Adjustable (A)			0.15	0.15
	Labor (b)				
	Materials (c)				
	Equipment usage (d)				
		Total			1.00

*Normally following source of index shall apply. Public Entity shall choose applicable Index for each item.

(a) Labor: "National Salary and Wage Rate Index"- "Construction Labor" of Nepal Rastra Bank or rate fixed by District Rate Fixation Committee

(b) Material:"National Wholesale Price Index" - Construction Materials" of Nepal Rastra Bank

(c) Equipment usage: "National Wholesale Price Index" - "Transport Vehicles and Machinery Goods" of Nepal Rastra Bank or "Fuel" Price fixed by Nepal Oil Corporation.

** Bidders proposed weightings should be within the range specified by the Employer in column - 5

Table of Price Adjustment Data

[To be used if Price Adjustment is applicable as per GCC 53.6]

Code	Construction Material*	Unit	Base Price (NRs/Unit) (Ex-factory)	Source (Factory)**
1	2	3	4	5

* Major construction materials to be specified by Employer in column - 2.

** Base Price and source normally to be specified by Employer (or alternatively informed to be proposed by bidder) in column 4 and 5.

Note:

The base prices of the construction materials shall be taken as of 30 days before the deadline for submission of the Bid as quoted by the Bidder and verified by the Employer. For the purpose of calculation of price adjustment, the Ex-factory price of the same source shall be taken into consideration.

Bid Security

Bank Guarantee

Bank's Name, and Address of Issuing Branch or Office
(On Letter head of the 'A' class Commercial Bank)

Beneficiary: ..... **name and address of Employer** ……

Date: ……Bid Security No.: .....

We have been informed that. …… ***[insert name of the Bidder]*** (hereinafter called "the Bidder")intends to submit its bid (hereinafter called "the Bid") to you for the execution of ……...***name of Contract*** . …… under Invitation for Bids No. …… ("the IFB").

Furthermore, we understand that, according to your conditions, bids must be supported by a bid guarantee.

At the request of the Bidder, we…… . ***name of Bank*** …….. hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of . . ……...***amount in figures*** ……. ***(. ……..amount in words ……)*** upon receipt by us of your first demand in writing accompanied by a written statement stating that the Bidder is in breach of its obligation(s) under the bid conditions, because the Bidder:

(a) has withdrawn or modifies its Bid:

i) during the period of bid validity specified by the Bidder on the Letter of Technical and Price Bid, in case of electronic submission

(ii) from the period twenty-four hours prior to bid submission deadline up to the period of bid validity specified by the Bidder on the Letter of Technical Bid and Price Bid, in case of hard copy submission; or

(b) does not accept the correction of errors in accordance with the Instructions to Bidders (hereinafter "the ITB"); or

(c) changes the prices or substance of the bid while providing information pursuant to clause 27.1 of ITB; or

(d) having been notified of the acceptance of its Bid by the Employer during the period of bid validity, (i) fails or refuses to execute the Contract Agreement, or (ii) fails or refuses to furnish the performance security, in accordance with the ITB.

(e) is involved in fraud and corruption in accordance with the ITB

This guarantee will remain in force up to and including the date ……***number***……days after the deadline for submission of Bids as such deadline is stated in the instructions to Bidders or as it may be extended by the Employer, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this guarantee should reach the Bank not letter than the above date.

This Bank guarantee shall not be withdrawn or released merely upon return of the original guarantee by the Bidder unless notified by you for the release of the guarantee.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 758.

. . .Bank's seal and authorized signature(s) . . .

Note:

The bid security of ……..…… has been counter guaranteed by the Bank ……..……..…… on ……... ....……..…… (Applicable for Bid Security of Foreign Banks).

Technical Proposal Format

Personnel

Equipment

Site Organization

Method Statement

Mobilization Schedule

Construction Schedule

Others

Personnel

Form PER - 1: Proposed Personnel

Bidders should provide the names of suitably qualified personnel to meet the specified requirements for each of the positions listed in Section III (Evaluation and Qualification Criteria). The data on their experience should be supplied using the Form below for each candidate.

No.	Name	Position*	Academic Qualification	Total Work Experience [Years]	Experience in Similar Works [years]
1.					
2.					
3.					
4.					
5.					

* As listed in Section III (Evaluation and Qualification Criteria).

Form PER - 2: Resume of Proposed Personnel

The Bidder shall provide all the information requested below. Fields with asterisk (*) shall be used for evaluation.

Position*		
Personal Information	Name	Date of Birth
	Professional qualifications	
Present employment	Name of employer	
	Address of employer	
	Telephone	Contact (manager/personnel officer)
	Fax	E-mail
	Job title	Years with present employer

Summarize professional experience over the last twenty years in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.

From*	**To***	**Company, Project, Position and Relevant Technical and Management Experience***

Note:

In case of e-submission the Resume of Proposed Personnel shall be submitted on notification by the Employer as per ITB 27.

Equipment

The Bidder shall provide adequate information to demonstrate clearly that it has the capability to meet the requirements for the key equipment listed in Section III (Evaluation and Qualification Criteria). A separate Form shall be prepared for each item of equipment listed, or for alternative equipment proposed by the Bidder. The Bidder shall provide all the information requested below, to the extent possible. Fields with asterisk (*) shall be used for evaluation.

(i) For the equipment under Bidder's ownership

No.	Equipment Type and Characteristics	Total Nos. of Equipment under Bidder's Ownership	No. of Equipment engaged/proposed for ongoing/committed contracts	Nos. of Equipment proposed for this contract
1.				
2.				
3.				
4.				
5.				

(ii) For the Equipment to be leased/hired

No.	Equipment Type and Characteristics	Total Nos. of Equipment under the ownership of lease/hire provider	No. of Equipment engaged/committed for other works	Nos. of Equipment proposed to be leased/hired for this contract
1.				
2.				
3.				
4.				
5.				

Type of Equipment*		
Equipment Information	Name of manufacturer	Model and power rating
	Capacity*	Year of manufacture
Current Status	Current location	
	Details of current commitments	
Source	Indicate source of the equipment	

	🗀 Owned 🗀 Rented 🗀 Leased 🗀 Specially manufactured

The following information shall be provided only for equipment not owned by the Bidder.

Owner	Name of owner	
	Address of owner	
	Telephone	Contact name and title
	Fax	email
Agreements	Details of rental / lease / manufacture agreements specific to the project	

The Bidder shall be solely responsible for the data provided. However, this shall not limit the right of Employer to verify the authenticity of submitted information.

Note:

In case of e-submission the "Agreements" shall be submitted on notification by the Employer as per ITB 27.1

Bidder's Information and Qualification Format

Site Organization

Method Statement

Mobilization Schedule

Construction Schedule

Others

Bidder's Qualification

To establish its qualifications to perform the contract in accordance with Section III (Evaluation and Qualification Criteria) the Bidder shall provide the information requested in the corresponding Information Sheets included hereunder.

Form ELI - 1: Bidder's Information Sheet

Bidder's Information	
Bidder's legal name	
In case of JV, legal name of each partner	
Bidder's country of constitution	
Bidder's year of constitution	
Bidder's legal address in country of constitution	
Bidder's authorized representative (name, address, telephone numbers, fax numbers, e-mail address)	
Attached are copies of the following original documents.	
1. In case of single entity, articles of incorporation or constitution of the legal entity named above, in accordance with ITB 4.1 and 4.2. 2. Authorization to represent the firm or JV named in above, in accordance with ITB 20.2. 3. In case of JV, letter of intent to form JV or JV agreement, in accordance with ITB 4.1. 4. In case of a government-owned entity, any additional documents not covered under 1 above required to comply with ITB 4.5.	

Form ELI - 2: JV Information Sheet

Each member of a JV must fill in this form

JV / Specialist Subcontractor Information	
Bidder's legal name	
JV Partner's or Subcontractor's legal name	
JV Partner's or Subcontractor's country of constitution	
JV Partner's or Subcontractor's year of constitution	
JV Partner's or Subcontractor's legal address in country of constitution	
JV Partner's or Subcontractor's authorized representative information (name, address, telephone numbers, fax numbers, e-mail address)	
Attached are copies of the following original documents.	
1. articles of incorporation or constitution of the legal entity named above, in accordance with ITB 4.1 and 4.2. 2. Authorization to represent the firm named above, in accordance with ITB 20.2. 3. In the case of government-owned entity, documents establishing legal and financial autonomy and compliance with commercial law, in accordance with ITB 4.5.	

Form LIT - 1: Pending Litigation

Each member of a JV must fill in this form

Pending Litigation			
☐ No pending litigation in accordance with Criteria 2.2 of Section III (Evaluation and Qualification Criteria) ☐ Pending litigation in accordance with Criteria 2.2 of Section III (Evaluation and Qualification Criteria)			
Year	**Matter in Dispute**	**Value of Pending Claim in NRS**	**Value of Pending Claim as a Percentage on Net Worth**

Form FIN - 1: Financial Situation

Each Bidder or member of a JV must fill in this form

Financial Data for Previous 3 Years [in NRS]		
Year 1 :	**Year 2 :**	**Year 3 :**

Information from Balance Sheet

Total Assets			
Total Liabilities			
Net Worth			
Current Assets			
Current Liabilities			

Information from Income Statement

Total Revenues			
Profit Before Tax			
Profit After Tax			

- Attached are copies of financial statements (balance sheets including all related notes, and income statements) for the last three or above years, as indicated above, complying with the following conditions.
- All such documents reflect the financial situation of the Bidder or partner to a JV, and not sister or parent companies.
- Historic financial statements must be audited by a certified auditor.
- Historic financial statements must be complete, including all notes to the financial statements.
- Historic financial statements must correspond to accounting periods already completed and audited (no statements for partial periods shall be requested or accepted).

Note:

In case of e-submission the attachments should not be uploaded but shall be submitted on notification by the Employer as per ITB 27.1

Form FIN - 2: Average Annual Construction Turnover

Each Bidder or member of a JV must fill in this form

The information supplied should be the Annual Turnover of the Bidder or each member of a JV in terms of the amounts billed to clients for each year for work in progress or completed to NRs at the end of the period reported.

Annual Turnover Data for the Last 10 Years (Construction only)	
Year	Amount Currency

- **Average Annual Construction Turnover (Best three years within the last 10 years)**

Form FIN - 3: Financial Resources

Specify proposed sources of financing, such as liquid assets, unencumbered real assets, lines of credit, and other financial means, net of current commitments, available to meet the total construction cash flow demands of the subject contract or contracts as indicated in Section III (Evaluation and Qualification Criteria).

Financial Resources		
No.	**Source of financing**	**Amount (in NRS)**
1		
2		
3		

Note :

The letter from the Bank must be unconditional.

Form FIN- 4: Current Contract Commitments / Works in Progress

Bidders and each partner to a JV should provide information on their current commitments on all contracts that have been awarded, or for which a letter of intent or acceptance has been received, or for contracts approaching completion, but for which an unqualified, full completion certificate has yet to be issued.

Current Contract Commitments									
No.	**Name of Contract**	**Name of the Contractor/s**	**Employer's Contact Address, Tel, Fax**	**Contract Amount**	**Contract Date**	**Contract Duration**	**Value of outstanding works [NRS]**	**Estimated Completion Date**	**Average Monthly Invoicing [NRS/month]**
1									
2									
3									
4									
5									
6									

Form EXP - 1: General Construction Experience

Each Bidder or member of a JV must fill in this form.

General Construction Experience				
Starting Month Year	**Ending Month Year**	**Year**	**Contract Identification and Name and Address of Employer Brief Description of the Works Executed by the Bidder**	**Role of Bidder**

Form EXP - 2(a): Specific Construction Experience

Fill up one (1) form per contract.

Contract of Similar Size and Nature			
Contract No…… of…..	**Contract Identification**		
Award Date		**Completion Date**	
Role in Contract	☐ **Contractor**	☐ **Management Contractor**	☐ **Subcontractor**
Total Contract Amount	☐ **NRS ……..**		
If Partner in a JV or subcontractor, specify participation of total contract amount	**Percent of Total**	**Amount**	
Employer's Name **Address** **Telephone/Fax Number** **E-mail**			
Description of the similarity in accordance with Criteria 2.4.2 (a) of Section III			
Note : ***The Employer should insert here contract size, complexity, methods, technology, or other characteristics as described in Section VI (Work Requirements) against which the bidder demonstrates similarity in the box on the right-hand-side.***			

Description of the similarity in accordance with Criteria 2.4.2 (a) of Section III	
Participation as Prime contractor, management contractor, or subcontractor, in at least single Contracts within the last ten (10) years, each with a value of at least NRs 100 million. that have been successfully or are substantially completed and that are similar to the proposed works.The similarity shall be based on the physical size, complexity, methods, technology or other	

Form EXP - 2(b): Specific Construction Experience in Key Activities

Fill up one (1) form per contract.

Contract of Similar Size and Nature			
Contract No…… of……..	**Contract Identification**		
Award Date		**Completion Date**	
Role in Contract	☐ **Contractor**	☐ **Management Contractor**	☐ **Subcontractor**
Total Contract Amount	☐ **NRS** ……..		
If Partner in a JV or subcontractor, specify participation of total contract amount	**Percent of Total**	**Amount**	
Employer's Name **Address** **Telephone/Fax** **Number** **E-mail**			
Description of the similarity in accordance with Criteria 2.4.2 (a) of Section III			
Note : *The Employer should insert here production rate(s) for the key activity (activities) subject contract against which the bidder demonstrates in the box on the right-hand-side production rates achieved by him on previous contracts.*			

Description of the similarity in accordance with Criteria 2.4.2 (b) of Section III	
For the above or other contracts executed during the period stipulated in 2.4.2(a) above,a minimum construction experience in the following key activities : (1) Raod Construction Works. (2) ……. Single entity must meet requirements. In case of joint venture, all partners combined must meet requirements.Document required: Form EXP-2(b)	

Price Adjustment : Table A - Local Currency

Sl No.	Index Description	Source of Index	Base Value	Base Date	Employer's Proposed Weighting coefficient Range from	Employer's Proposed Weighting coefficient Range to	Bidder's Proposed Weight
1	Non-Adjustable(A)				0.15	0.15	
2	Labor (b)	District Rate ,FY 2074/75	590	Bid Submission date - 30 days	0.15	0.20	
3	Materials (c)	National Wholesale Price Index" - Construction Materials" of Nepal Rastra Bank	0	Bid Submission date - 30 days	0.5	0.6	
4	Equipment usage (d)	"Fuel" Price fixed by Nepal Oil Corporation	0	Bid Submission date - 30 days	0.2	0.25	
						Total	1

SECTION-V

Eligible Countries

ELIGIBLE COUNTRIES

For the purpose of ITB 4.2:

Nepal

For the purpose of Country of Origin ITB 5.1 and GCC 79.2:

All Countries

Part II: Bidding Procedures

SECTION-VI

Works Requirements

Government of Nepal
National Reconstruction Authority

District Level project Implementation Unit (DLPIU)

Grant Management and Local Infrastructure (GMaLI)
Hetauda, Makwanpur

Specification

for

Reconstruction and Upgrading of

Bhimphedi-Kogate-Ipa-Deurali Road Project

Contract No.: NRA/CLPIU/GMaLI/MAK/W/PDRF/01

Employer: District Level Project Implementation Unit (DLPIU/GMaLI) Hetauda, Makwanpur

Country: Nepal

Standard Specifications for this contract shall be

1. "**Technical Specifications for Labour - Based Construction Works of Agricultural and Rural Roads" (TSLBCWAR)** issued under the authority of Government of Nepal, Ministry of Local Development, Department of Local Infrastructure Development and Agricultural Roads – DoLIDAR (December,1999)

and

1. **"Standard Specifications for Road and Bridge Works"(SSRBW)** issued under the authority of the Government of Nepal, Ministry of Physical Infrastructure and Transport, Department of Roads (2073)

Please visit following web site for required Specifications
www.dolidar.gov.np

www.dor.gov.np

"Technical Specifications for Labour - Based Construction Works of Agricultural and Rural Roads" issued under the authority of Government of Nepal, Ministry of Local Development, Department of Local Infrastructure Development and Agricultural Roads – DoLIDAR and The "Standard Specifications for Road and Bridge Works" issued by the Government of Nepal, Ministry of Physical Infrastructure and Transport, Department of Roads together with these Special Provisions shall be used to specify the construction of the Works.

The Special Provisions contained herein shall be read in conjunction with the Standard Specifications and shall supplement, replace or supersede the Standard Specifications as appropriate. Where there is any ambiguity or discrepancy between the Standard Specifications and the Special Provisions; the Special Provisions shall have preference and shall govern.

Specification for General Items

Specification for General Items

Insurance –*refer GCC clause -19.1 of SBD*

Provision of Site Office– *Refer Section 6 –Employer's Requirements of SBD- Special provision to Specification*

Establishment of Site office for DLPIU supervision team

Add the following clause to the clause 101 of "Standard Specifications for Road and Bridge Works" issued by Department of Roads .

The contractor shall provide and maintain a site office (hereinafter referred to as 'Office') with a plinth area of 60 m2 for use of Project Manager as agreed herein. Unless the Project Manager agrees otherwise, all facilities provided for his use shall be new.

The full details which the Contractor proposes to provide for the Project Manager shall be submitted, for the Project Manager's approval, within 15 days of the signing of the contract.

The Contractor shall not complete any arrangements, nor place orders for the purchase of any items, nor start work on the installation of the Project Manager's facilities until he has received the approval of the Project Manager.

On completion of works in accordance with the Conditions of Contract, the Project Manager will instruct the Contractor to remove those facilities not required during the DLP. At the end of DLP the Contractor shall remove the remaining facilities from site in accordance with the Conditions of Contract.

All buildings, fittings, office equipment and furnishing provided for the use of Project Manager shall become the property of the contractor after the completion of the Contract.

The details of location, layout and type of Office that the contactor proposes to provide shall be submitted to the Project Manager for his prior approval.

All rooms shall be provided with sufficient ventilation, ceiling lights, power outlets and curtains. All doors shall have lock with two keys and all opening windows shall be fitted with mosquito screens.

Drinking water for domestic use shall be supplied to the building together with sufficient tank storage to provide continuous running water. The office shall have toilet and bathroom finished with tile work.

Furniture

1.	Office table:	2 nos.
2.	Meeting table	1 nos
3.	Office chair cushioned with arms	6 nos.
4.	Office Chairs Plastic	12 nos
5.	Steel filing cabinet (4 drawers)	1 no.
6.	Office cupboard, steel (1m wide, 4 shelves)	2 nos.
7.	Desktop computer with printer	1 nos

8. Gas stove with two filled LPG Cylinder with necessary cooking and dining utensils for 10 persons.

The costs of providing office, equipment, furnishing and maintaining shall be deemed to be included in the price inserted under the relevant item of the Bill of Quantities.

Additional Test - *refer GCC clause -42.1 of SBD*

Relocation of Utilities – *DoLIDAR-Tech. Spec. for LBCWARR*

G -10 PUBLIC UTILITIES

No clearance or alterations to the utility shall be carried out unless specially ordered by the Engineer.

Any services affected by the works must be temporarily supported by the Contractor/Users' Group. The Contractor/Users' Group must take all measures reasonably required by various bodies to protect their services and property during the progress of the works.

The Contractor/Users' Group may be required to carry out certain works for and on behalf of various bodies and shall also provide, with the prior approval of the Engineer, such assistance to various bodies as may be authorised by the Engineer.

The work of temporarily supporting and protecting the public utility services during execution of the works shall be deemed to be part of the contract and no extra payment shall be made for the same.

The Contractor/Users' Group may be required to carry out the removal or shifting of certain services/utilities on specific orders from the Engineer for which payment shall be made to him. Such works shall be taken up by the Contractor/Users' Group only after obtaining clearance from the Engineer and ensuring adequate safety measures.

Carry out maintenance of the existing road (*DoLIDAR-Tech. Spec. for LBCWARR G 12*

G-12 Arrangement for Traffic during Construction (only when necessary

G-12.1 General Arrangement

The Contractor or the Users' Group shall be responsible for carrying out work on the road with minimum interference to the traffic as well as without affecting the satisfactory execution of the construction works. While the improvement works of the rural road are in progress, the construction party shall follow the respective directions issued by the Engineer. A passage of traffic either along a part of the existing carriageway or along a temporary diversion shall be opened prior to the closure of road section for improvements.

G-12.2 Traffic Passage along a part of the Existing Carriageway under Improvement

This situation will occur when an existing road is subjected to the following improvements:

- Widening of the carriageway;
- Strengthening of the existing pavement;
- Reconstruction or repair of cross-drainage works, etc.

and where a part of the road width provides enough space for such work, leaving the remaining part for traffic. To make room for this passage of traffic, the shoulder is often required to be widened; levelled; dressed and maintained throughout the duration of work. This work needs to be done to the satisfaction of the Engineer.

For works in long continuous stretches, passing passage of 20 m X 6 m inclusive of the width of the existing carriageway shall be provided at 500 m intervals or as directed by the Engineer.

G-12.3 Traffic Passage along a Temporary Diversion (only when necessary)

Where a passage for traffic on a part of the carriageway is not possible, a temporary diversion closer to the road alignment needs to be opened. The necessary temporary crossings shall be provided on the approval of Engineer.

G-12.4 Traffic Safety and Control (only when necessary)

During the construction of road, the party responsible for the construction shall ensure the safety of traffic. In this regard, the construction party shall provide, erect and maintain the necessary

- barricades
- signs
- markings
- flags
- lights and flag men, etc.

to provide the correct information to the vehicles in order to ensure the safety of approaching and passing traffic.

A phased programme for the diversion of traffic shall be drawn up with the Engineer prior to the commencement of work. Where a part of the carriageway becomes inadequate for two lane traffic, one-way traffic operation shall be established. Suitable regulatory or warning signs shall be placed on both approaches to provide necessary guidance to the road users.

Upon the approval of Engineer, the signs on each approach shall be placed as follows:

one, close to the point where transition of carriageway begins, and

the other, 120 m away.

G-12.5 Maintenance of Diversion and Traffic Control Devices

All the diversion and traffic control devices which are mentioned in paragraph G-12.4 shall be well maintained to the satisfaction of the Engineer.

G-12.6 Measurements for Payment

Measurement of the above works shall be done in the following ways:

(a) Incidental to the Contracted Work: The works performed in respect of maintaining an uninterrupted traffic flow through the section of road under improvements shall be considered as incidental to the contracted works with the exclusion of provisional works.

(b) Provisional Works: Temporary diversions, initial dressing of the shoulders and additional passing passages.

The former shall be paid from the contracted sum and the latter from the provisional sum.

Supply of Supervision Vehicle – *Refer Section 6 –Employer's Requirements of SBD- Special provision to Specification*

101.02 Vehicle for the Employer

Not Applicable.

Project Information Board – *SSRBW- July 2001 DOR Section-108*

108- Notice Board

The Contractor shall erect notice boards (1.8m_1.2m) at each end of the site giving details of the contract in the format and wording as directed by the Engineer. These boards shall be erected within 14 days after the Contractor has been given the Possession of Site.

The Contractor shall not erect any advertisement sign board on or along the work without the written approval of the Employer.

All sign boards shall be removed by the Contractor by the end of the Defects Liability Period.

Provision and Maintenance of Labour Camps at the site - *SSRBW- July 2001 DOR Section-511*

Refer specification of Environment Mitigation Measures below

Establish, maintain and operate laboratory at the site - *SSRBW- July 2001 DOR Section-511*

511. LABORATORY

(1) The Laboratory shall be located on the site as described in the contract or shown on the Drawing. It may be established specifically for the contract with the approval of the Engineer.

(2) Setup

All laboratories to be provided under the contract shall be set up and shall be in fully operating condition not later than sixty days after the Engineer's order to commence the work.

No construction work shall be permitted until the laboratories have been accepted by the Engineer.

If the Contractor fails to provide the laboratories within the specified period, the Engineer shall make alternative arrangements as he considers necessary. These arrangements may include the use of rented accommodation, purchased caravans, portacabins and/or the contracting of laboratory services etc. The Contractor shall bear all the costs of such temporary arrangements made by the Engineer, including that of additional transport.

(3) Laboratory Equipment

All equipment necessary for testing of materials and workmanship shall be deemed to form part of the permanent works unless otherwise provide in the contract. It shall be delivered to the site in accordance with the schedule of requirements of such equipment described in the contract. However the non-inclusion of any item of such equipment in the schedule of requirements shall not relieve the Contractor of the responsibility to supply it if it is required for the proper control of the quality of the materials and/or workmanship, notably when identified in the list of appropriate equipment to be supplied in accordance with Clause 504 (1) (c). The equipment shall be delivered to the site not later than sixty days after the order to commence the works.

(4) Ownership

Unless otherwise stated in the contract the ownership of all laboratories and equipment shall revert to the Contractor.

(5) Attendance

The Contractor shall keep the Laboratories in a well maintained, clean and habitable condition.

The Contractor shall keep all laboratory equipment in good working condition throughout the period of the Contract at his own expense.

The Contractor shall provide all tools, consumable items for testing and all the assistance as may be required by the Engineer and his staff for measuring and checking the works.

(6) Measurement

(a) The laboratory which has been sent up and equipped as per requirement of these Specifications shall be measured for payment in number.

(b) Laboratory Equipment

The laboratory equipment provided as per the required list of these Specifications shall be measured for payment in one lot for each laboratory.

(c) Laboratory Staff

The laboratory staff assigned as per requirement confirming to the list provided in the contract shall be measured in man-month for each personnel. The man-month shall include the holidays and leaves as specified in the contract.

(7) Payment

(a) Laboratory

The laboratory as measured in number shall be paid as per the contract price on lumpsum basis. The contract price shall be the full and the final compensation to the Contractor for providing the laboratories premises; electricity supply; water supply, gas and heating, attendance etc. in accordance with the requirement of the Specifications.

(b) Laboratory Equipment

The laboratory equipment measured in a lot shall be paid as per contract price on lump sum basis. The contract price shall be the full and the final compensation to the Contractor for providing and maintaining all the equipment required for the proper control of the quality of the materials and/or workmanship in accordance with these Specifications. The price shall also include the cost for tests to be conducted outside the site laboratories.

(c) Laboratory Staff

The laboratory staff shall be paid at the contract unit rate for each personnel required and assigned to the laboratory, in accordance with their position and responsibilities. The duration of the personnel shall be as required by the quality control and testing activities according to the general programme of testing. The remuneration rate shall cover salaries, including overtime remuneration if any, allowances, bonuses, social charges and overheads, travel, accommodation and miscellaneous and incidental expenses etc. and all costs incurred by the Contractor for the staff who will render their services in the laboratory on site for the duration as required

Add following clause specified in Section 6 –Employer's Requirements of SBD- Special provision to Specification

101.03 Provision of Site Laboratory

Where indicated in the Bill of Quantities, the Contractor shall provide, operate and maintain an adequately equipped site Laboratory complete with all utilities, services apparatus and fittings to undertake the required testing to assure the quality of the materials and the works. The Contractor shall also supply and provide, at the laboratory the standards listed in specifications. The laboratory space including lab office and lab arrangement shall be with plinth area of approximately 220 sq. m with three (3) rooms plus one additional large hall, outside covered veranda and toilet bathroom. The Site Laboratory shall be located within 500 m of the site and the lab building may be located at the rented building

or newly constructed on rented land. The laboratory shall be available up to the end of the project. The complete laboratory facilities shall include the provision of land, site grading, access roads, covered parking facilities for vehicles, construction of building and all necessary appurtenance such as electricity, drainage systems, fences and utilities etc. The contractor shall supply furniture, fittings, equipment, vehicle, manpower and materials to provide fully functional site laboratory.

The site laboratory shall be ready to use within 4 weeks from the date of the Engineer's notice to commence the Works. Alternative arrangement for testing shall be made by the date of commencement of works.

The Contractor shall be fully responsible for the equipment including:-

- Maintaining, calibrating and servicing equipment as required.
- Repairing all defects including accidental damage as required.
- Replacing any lost or stolen items.
- Effecting insurance of the equipment against damage or loss.
- The tests which cannot be performed at site shall be carried out off the site at renowned laboratory acceptable to the Engineer.

The site lab shall be made available for testing as long as it is required including any period after the Completion of construction during which it is required for final measurement purposes.

At the completion of the project, the furniture and equipment shall revert to the Contractor.

Following are the required test need to be carried out in Site Laboratory; the Contractor shall be full responsible for the apparatus and equipment required for the following tests

Tests Applicable to disturbed/Undistributed Samples of Soils and Gravels

Moisture Content , Liquid Limit, Plastic Limit, Plasticity Index, Linear Shrinkage, Specific Gravity of Particles, Particles Size Distribution, Organic Matter content, Total Sulphate Content, pH Value, Density - Moisture Content relationship(4.9 kg rammer), California Bearing Ratio, Field Dry Density

1. **Tests Applicable to disturbed/Undistributed Samples of Soils and Gravels**

Moisture Content , Liquid Limit, Plastic Limit, Plasticity Index, Linear Shrinkage, Specific Gravity of Particles, Particles Size Distribution, Organic Matter content, Total Sulphate Content, pH Value, Density - Moisture Content relationship (4.9 kg rammer), California Bearing Ratio, Field Dry Density

2. **Tests Applicable to disturbed/Undistributed Samples of Soils and Gravels**
   Particle Size Distribution (Gradation), Clay, Silt, Dust in Aggregates, Flakiness Index, Specific Gravity, Moisture Content, Bulk Density, Voids & Bulking, Water Absorption, Crushing Ratio, Los Angeles Abrasion, AIV-ACV, Bitumen Adhesiveness (Vialit Test),Deleterious Substances Crushing Strength of Stone

3. **Tests Applicable to Requirement on the Physical Characteristics of Cement**
   Finess, m2/kg: (by Blaine's Air Permeability method), Setting Time: Minimum Initial and maximum Final Setting Time (minutes), Soundness by Lechatelier Method, mm, maximum , Compressive Strength: Minimum average Compressive Strength of three mortar cube (N/mm)

4. **Tests Applicable to Requirement on the Physical Characteristics of Concrete**
   Air contents of fresh concrete, Density of hardened concrete, Compressive strength of concrete cubes, Mixing and sampling fresh concrete in laboratory, Marking test cubes from fresh Concrete

5. **Tests Applicable to Bituminous Binder - Straight Run Bitumen**
   Penetration, Softening point (Ring and Ball), Flash and fire points (Cleveland open Cup), Loss on heating, Ductility, Water Content, Solubility in Trichloroethylene, Specific gravity, Penetration of residue from loss on heating

6. **Tests Applicable to Bituminous Binder - Cut Back Bitumen**
   Kinematic viscosity- Flash point (Tag open cup) (RC-MC) and Flash point (Cleveland open Cup) (SC),Penetration, Specific gravity by hydrometer method, Asphalt residue of 100 pen (SC),Water Content, Distillation, Penetration of residue from distillation, Ductility of residue from distillation, solubility of residue from distillation

7. **Tests Applicable to Bituminous Mixtures**
   Determination of: Moisture and volatile distillates, Quantitative extraction of bitumen, Specific gravity of compacted mixture, Recovery of bitumen from solution, Coating and stripping,) Degree of particle coating, Maximum specific gravity, Degree of pavement compaction, Marshall stability

8. Tests Applicable to Gabion Wires

Zinc Coating, Diameter

Environmental Mitigation Works and Social compliance and safeguards- ***Standard Specification for Road and Bridge Works (SSRBW) - DOR, July 2001, Section-109***

109. ENVIRONMENTAL PROTECTION WORKS

The environment has been defined to mean surrounding area including human and natural resources to be affected by execution and after completion of works.

The Contractor shall take all precautions for safeguarding the environment during the course of the construction of the works. He shall abide by all prevailent laws, rules and regulations governing pollution and environmental protection mitigation measure specified in the Latest Publication of "**Environmental Management Guidelines"** published by the Department of Roads.

The Contractor shall prohibit employees from unauthorized use of explosives, poaching wildlife and cutting trees. The Contractor shall be responsible for the action of his employees.

Environmental protection works, among others, shall also include he following:

(1) Borrow/Quarry Sites

The Engineer shall have the power to disallow the method of construction and/or the use of any borrow/quarry area, if in his opinion, the stability and safety of the works or any adjacent structure is endangered, or there is undue interference with the natural or artificial drainage, or the method or use of the area will promote undue erosion.

All areas susceptible to erosion shall be protected as soon as possible either by temporary or permanent drainage works. All necessary measures shall be taken to prevent concentration of surface water and to avoid erosion and scouring of slopes and other areas. Any newly formed channels shall be backfilled.

Borrows/quarries shall be located away from the population centers, drinking water intakes, cultivable lands and drainage systems. The cutting of trees shall be minimized. Temporary ditches and/or settling basins shall be dug to prevent erosion. The undesirable ponding of water shall be prevented through temporary drains discharging to natural drainage channels.

Earthworks operations shall be strictly limited to the areas to be occupied by the permanent works and approved borrow areas and quarries unless otherwise permitted by the Engineer. Due provision shall be made for temporary drainage. Erosion and/or instability and/or sediment deposition arising from earthwork

operations not in accordance with the Specifications shall made good immediately by the Contractor.

The Contractor shall obtain the permission of the Engineer before opening up any borrows pits or quarries. Such borrow pits and quarries may be prohibited or restricted in dimensions and depth by the Engineer where:

(i) they might affect the stability or safety of the works or adjacent properly;

(ii) they might interfere with natural or artificial drainage or irrigation;

(iii) they may be environmentally unsuitable.

The Contractor shall not purchase or receive any borrow materials from individuals unless the source of such materials has been approved by the Engineer.

At least 14 days before he intends to commence opening up any approved borrow pit or quarry, the Contractor shall submit to the Engineer his intended method of working and restoration. These shall include but not be limited to:

(i) the location, design and method of construction of any access track;

(ii) the volume and nature of materials to be removed;

(iii) the sequence and method of excavation of materials;

(iv) measures for controlling runoff and sediment from the site during operations;

(v) Proposals for site restoration including approximate finished levels, drainage, erosion and sediment control, slope stabilization and revegetation, including reinstatement of any access track.

Operations of borrow pit or borrow area shall not be permitted until the method of working for that particular pit or area has been approved by the Engineer in writing. Restoration shall be to the satisfaction of the Engineer.

(2) Disposal of Spoil and Construction Waste

Materials in excess of the requirements for permanent works and unsuitable materials shall be disposed off in locations and in the manner as agreed with the Engineer. The locations of disposal sites shall be such as not to promote instability, destruction of properties and public service systems. Exposed areas of such disposal sites shall be suitably dressed and be planted with suitable vegetation.

The Contractor shall plan his works in such a way that there is no spillage of POL products to the surface or sub-surface water.

(3) Provision and Maintenance of Camps, Offices, Stores, Equipment Yards and Workshops

Various works defined under this item are related to provision an maintenance of camps for workperson and employees, Contractor's site offices, stores equipment yards and workshops. These camps must be adequate, rain-proof, spacious, airy and hygienic with proper lightning and materials storage facilities. The area shall be kept neat and clean.

Space allocated for storage of materials such as cement, gabion wire, reinforcing wire etc. shall in general be damp-free, rain-proof and away from petroleum products storage.

Permission may be granted by the engineer to erect suitable camps within the right of way free of charge, if such establishments do not cause obstructions to traffic, nuisance to works execution and adverse effect to the environment.

Written information must be given to and approval be taken from the Engineer regarding proper establishment and maintenance of such camps. Failure in compliance with Engineer's instruction in respect of overall standard will lead to reduction or with holding of payment.

(4) Provision and Maintenance of Toilets

Provision of toilets for labour and employees shall be made to avoid public nuisance as well as pollution of water courses and air. The Contractor shall construct suitable septic tanks and/or soak pits along with room of pit-type latrines. Sufficient water must be provided and maintained in the toilets. Proper methods of sanitation and hygiene should be employed during the whole project duration.

(5) Provision of Potable Water

The Contractor shall supply potable water alongwith commencement of work to Contractor's staff and workperson both at camps and construction-sites. This arrangement shall be enforced to avoid proliferation and generation of various water borne-diseases.

The Contractor shall inform the Engineer regarding sources, installation and operation of supply of potable water within a week after the supply is commenced.

(6) Provision of First Aid/Medical Facilities

Provision of first aid/medical facilities shall be made along with commencement of work to provide quick medical service to injured/sick work person, and employees. Services shall also include on-the way service and other arrangements required for taking them to the nearest hospital in case of emergency.

The scope of works shall include service of at least one part-time experienced health worker/health assistant with a minimum of once a week full time site visit as work assignment. The Contractor shall also supply and provide adequate medicines and facilities required for standard first aid.

The Contractor shall inform the Engineer regarding the medical facility within a week after its establishment and operation.

(7) Crushing Plants

Crushing plants shall be located away from the population centers, water intakes and should not disturb the sensitive echo system. Suitable dust control device shall be filled to be the crusher to control emission of dust from the plant.

(8) Hot Mix Plants and Batching Plants

Hot-mix plants and batching plants shall be located away from the population centers. The Contractor shall take every precaution to reduce levels of noise, vibration; dust and emission form his plants.

No bituminous material shall be discharged into drains. Nearby trees, vegetation and property shall be protected during spraying of bitumen.

(9) Hazardous Materials

The Contractor shall not store hazardous materials near water surfaces. The Contractor shall provide protective clothing or appliances when it is necessary to use some hazardous substances.

High concentration of airborne dust resulting in deposition and damage to crops and water resources shall be avoided. The Contractor shall take every precaution to control excessive noise resulting in disruption to wildlife and human population.

Only controlled explosives methods shall be applied and used in construction works.

(10) Reinstatement of Environment

The Contractor shall arrange and execute works as well as related activities in such a way that environmental conditions are reinstated. He may be required to carry out filing, removal and disposal works along with plantation of grass and trees as directed by the Engineer at his own costs at identified locations to reinstate environment.

Written instruction/approval shall be given by/sought from the Engineer regarding reinstatement of environment both during and after completion of works and upto the end of Defects Liability Period.

(11) Measurement and Payment

No separate measurement and payment shall be made for the works described in this Clause.

SITE CLEARANCE WORKS- ***(Tech. Spec. for LBCWARR) Clause No.: 1-1.5(a), 1-1.5(b) & 1-1.6)***

1 -1 CLEARING AND GRUBBING

1-1.1 Description

Clearing and grubbing shall be carried out prior to earthwork.

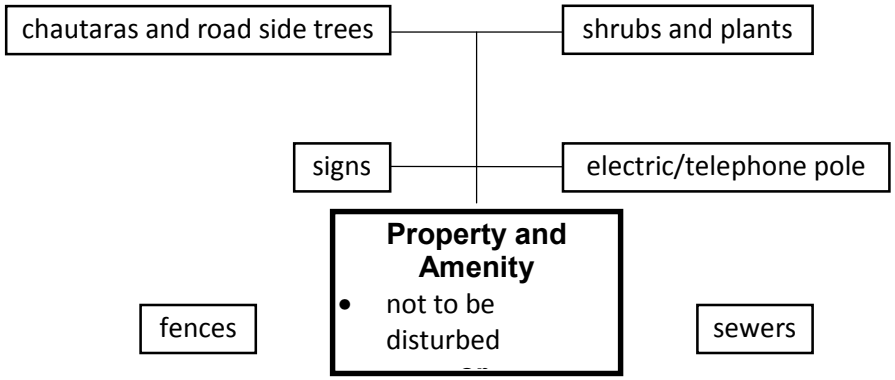
The work includes the removal and disposal of objects such as,

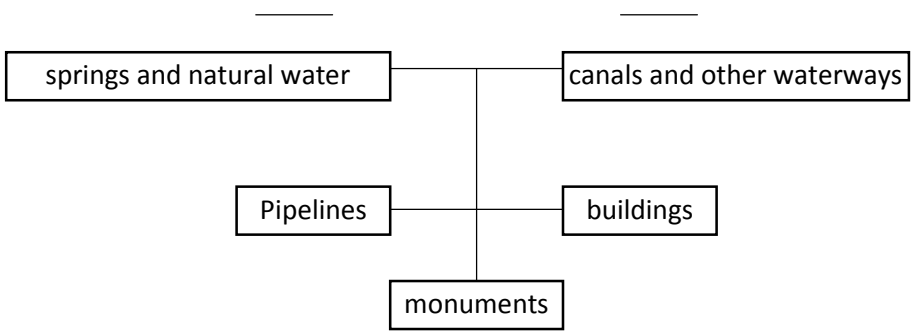
- trees
- bushes
- shrubs
- stumps
- rubbish
- and other obstacles to work.

1-1.2 Preservation of Property/Amenity

The cost required for protecting the property and amenity shall be considered as included in the item rate of the contracted work.

(a) The objects which shall not be disturbed or otherwise be protected are as follows:





(b) The Users' Group/Contractor who will be entrusted the work shall take adequate measures against the environmental degradation such as:

- soil erosion and
- water pollution of the concerned area.

(c) The Users' Group/Contractor shall submit the following documents to the Engineer for approval prior to the commencement of such work.

- work plan and proposed procedure for the disposal of waste materials
- schedules for carrying out temporary and permanent erosion control work as stated in clause 2-6.3.

1-1.3 Methods, Tools and Plants

Clearing and grubbing work shall be carried out as per the following guidelines:

(a) The adopted methods, tools and plants

- should not affect the property to be preserved while carrying out the activities.
- are to be approved by the Engineer prior to the commencement of work.

(b) The roots of trees, stumps, etc. which fall within the cut and fill lines shall be removed up to a minimum depth of 0.5 m below the ground level.

(c) The roots of trees and stumps which fall immediately beyond the fill lines shall be removed up to 0.15 m below ground level so that they are not noticeable after clearing.

(d) Such deeply excavated pockets which are created as a result of the removal of trees, stumps, etc. shall be filled with suitable fill material and compacted properly in order to make such surfaces affirmed with the surrounding ground surface.

(e) Vegetation such as roots, secondary growth, grass and other organic substances which are unsuitable as fill material shall be removed from fill areas to the satisfaction of the Engineer.

(f) The branches of trees extending above the roadway shall be trimmed as directed by the Engineer.

1-1.4 Disposal of Cleared Materials

The work under this item shall be carried out as per the following order:

(a) All materials which originated as a result of clearing and grubbing operations shall be considered as the property of the owner of the concerned land. In this case, the owner may be a private (an individual citizen) or a public (Government, VDC, etc.) party.

(b) Cleared materials shall be disposed by the Contractor/Users' group as directed by the Engineer and in accordance with the consensus of owner.

(c) Trunks and branches of trees shall be cleared up by cleaning the limbs and tops and stacked neatly within the right-of-way of each place.

(d) Products of clearing and grubbing which cannot be used or auctioned as determined by the Engineer shall be dumped to a dumping site/pit and burnt or buried. The dumping sites shall be determined as per the direction of Engineer.

(e) Precautionary measures shall be taken in advance to prevent any mixing up of cleared materials with the materials meant for embankment/road construction.

1-1.5 Measurements for Payment

The measurement of the work "clearing and grubbing" shall be taken by the Engineer for the purpose of payment to the Contractor/Users' Group. The following guidelines shall be followed in this regard:

(a) Unit of payment for clearing and grubbing shall be in m2.

(b) The item "clearing and grubbing" includes the cutting of trees less than 30 cm in girth measured at 1 m above the ground.

(c) The payment for cutting of trees having the following measurements shall be made separately by counting the number of trees belonging to the concerned range and by measuring the girth of individual tree at a spot 1 m above the ground.

- ⇒ girth of above 30 cm up to 60 cm
- ⇒ girth of above 60 cm up to 90 cm
- ⇒ girth of above 90 cm up to 180 cm
- ⇒ girth of above 180 cm up to 270 cm
- ⇒ girth of above 270 cm up to 450 cm.

If girth is above 450 cm, then the payment shall be made by extrapolating the rate of above range.

1-1.6 Rates

The rates for the item "clearing and grubbing" shall be determined as follows:

(a) The quoted unit rate in the contract shall be paid in full for all operations under the item "clearing and grubbing" which includes full compensation for labour, materials and any other incidentals.

(b) Where a contract does not include a separate item for clearing or grubbing then such work shall be covered as incidental to the earthwork items. In such cases, the quoted unit rate in the contract for earthwork item shall cover the expenses for clearing and grubbing as well.

Scarifying existing granular/bituminous road surface, (*DoLIDAR-Tech. Spec. for LBCWARR Clause No.2-5.7.6 and 2-5.4.3)*

2-5.4.3 Earthwork over Existing Road Surfaces

If the existing road surface is granular or bituminous and a new road surface is supposed to be constructed within 1 m range of height above the old one, then the existing road surface shall be scarified to a minimum depth of 50 mm for proper bondage between fill and the old formation.

If the existing road surface is of cement concrete and a new road surface is supposed to be constructed within 1 m range of height above the old one, then the existing pavement shall be removed completely prior to filling operation.

If the level difference between the existing and the new road surface is more than 1 m, then the existing surface may not be required to be scarified or removed.

2-5.7.6 Contract Unit Rate for Scarifying Existing Granular/Bituminous Road Surfaces

This rate shall cover the carrying out of required operations including full compensation for all labour, materials, safety precautions and incidentals necessary to complete the work as per the Specifications. It shall also cover handling, salvaging, stacking and disposing of the dismantled materials up to a lead of 100 m along the slope of lead route.

2-5.7.7 Contract Unit Rate for Dismantling and Removal of Cement Concrete Pavements

Clause 1-2.7 shall apply.

2-5.7.8 Contract Unit Rate for Preparing Filter Media adjacent to Structural Components

This rate shall cover the carrying out of required operations including full compensation for materials, labour and incidentals required to complete the work as per the Specifications.

2.3 Dismantling Works -*Dolidar-Tech. Spec. For LBCWARR Clause No.1-2 a,1-2,b 1-2,c)*

Dismantling Culverts, Bridges, Pavements And Other Structures(

1-2.1 Description

This item shall consist of operations such as

- dismantling and removal of the existing structures and utilities which are not suitable to be remained in place,
- salvaging or/and disposing of the resulting materials from the concerned site, and
- backfilling the trenches and pits which are created as a result of the removal of such structures.

The following types of structures and utilities shall be considered under this item:

- culverts
- bridges
- pavements
- kerbs
- guard rails
- fences
- utility poles
- manholes
- catch basins
- inlets, etc.

Dismantling and removal operations shall be completed prior to the start of new construction.

1-2.2 Dismantling Culverts and Bridges

The dismantling operation shall be carried out as per the following guidelines:

- It should be done carefully without causing damages to the materials which can be reused.
- Resulting materials which cannot be reused shall be removed from the site.
- All reusable materials shall be retained and salvaged for future use.
- Removal of overlying or adjacent materials, if required, shall be incidental to this item.
- Where the existing bridges/culverts are to be extended or otherwise incorporated in the new construction, only such part or parts of the existing structure shall be removed as it is necessary to provide a proper connection to the new component. In such cases, connecting edges shall be cut, chipped and trimmed to the required lines and grades while reinforcement bars shall be left to act as dowels.

Particularly in the case of pipe culverts, the hume pipes shall not be damaged during the dismantling operation.

While dismantling the steel framed structure, care must be taken in order to avoid any damages to its members.

If the structure which needs to be removed is in a condition suitable for re-creation or re-erection then,

- all members shall be match-marked with white lead paint before dismantling.

- end pins, nuts and bolts, gusset plates, etc. shall be match-marked to indicate their location.
- all pins, pinholes and machined surfaces shall be painted with a mixture of white lead and tallow.
- all loose parts shall be securely wired to adjacent members or packed in boxes.

While dismantling timber framed structures, care must be taken in order to prevent any damages to its members. Removed parts shall be salvaged as per the instruction of the Engineer.

1-2.3 Dismantling Pavements and Other Structures

The removal of unnecessary parts or the sections shall be carried out in such a way that the cut face at the joint should be perpendicular to the surface of the existing structure.

If the dismantled concrete structures or base course elements are to be reused then those shall be broken into pieces whose volume shall not exceed 0.02 m3 . Such pieces shall later be stock piled at the locations designated by the Engineer.

1-2.4 Backfilling

Ditches and cavities caused due to dismantling operations shall be backfilled with suitable fill material as directed by the Engineer. Such fill shall be compacted to the satisfaction of Engineer.

1-2.5 Disposals of Dismantled Materials

All materials which originated as a result of dismantling operations shall be considered as the property of the owner of the concerned structure. In this case, the owner may be a private (an individual citizen) or a public (Government, VDC, etc.) party.

All reusable materials shall be stock piled within the right-of-way at places designated by the Engineer. This includes hume pipes, steel parts, timber members and similar reusable materials.

Unless otherwise specified or directed, all structural steel shall be stored in blocks at locations convenient for loading.

Structures or elements of structures which are specified in the contract for re-erection shall be stored in separate piles.

Timber planks, beams or logs of old structures which are designated by the Engineer as materials to be salvaged shall be stacked in piles at locations convenient for loading. All nails, bolts and nuts should be removed prior to stacking.

All the products of dismantling operations which, in the opinion of the Engineer, cannot be reused or auctioned shall be disposed as waste materials. Such waste shall be kept away from the right-of-way of the road.

1-2.6 Measurements for Payment

The dismantling operations shall be measured in the respective units as follows:

- Dismantling brick/stone/concrete (plain and reinforced) masonry: in cubic metre.
- Dismantling flexible and cement concrete pavement: in cubic metre.
- Dismantling steel structures: in tonne.
- Dismantling timber structures: in cubic metre.
- Dismantling pipes, guard rails, kerbs, gutters, fencing: in linear metre.
- Utility poles: in numbers.

1-2.7 Rates

The quoted/agreed unit rates in the contract for the items of dismantling works shall be paid in full for carrying out the required operations including full compensation for labour, materials, protective measures and other incidentals.

Various operations included in each rate shall be dismantling, excavation, backfilling, piling, disposing, handling, hauling up to 100 m and related protective measures.

EARTHWORKS *(as per DoLIDAR-Tech. Spec. for LBCWARR Clause No. 2-1, 2-5)*

2 -1 ROADWAY AND DRAIN EXCAVATION

2-1.1 Description

This work which consists of excavation, removal and satisfactory disposal of all materials shall be necessary for the construction of

roadway (carriageway and shoulders)

side drains and

other cross drainage structures

and shall be performed in accordance with the

requirements of the Specifications

lines, grades and cross-sections given in the construction drawings

or

directions given by the Engineer.

Roadway and drain excavation work shall also include

hauling and stacking of cut and fill materials wherever necessary, and

trimming and finishing of the roadway surface and slopes.

2-1.2 Classification of Excavation Material

2-1.2.1 Authority for Classification

The classification of excavated material shall be decided by the Engineer or his representative. The decision of the Engineer shall be regarded as final within the scope of the contract (in case of Contractor) or the agreement (in case of Users' Group). Mere use of explosives shall not be entertained as the basis for higher classification.

2-1.2.2 Classification

All materials involved in excavation are classified below. At the field, these materials shall be identified and determined by the Engineer or his representative before or during the earthwork operation.

(a) Ordinary soil

shall comprise of organic soil, sand, silt, loam, clay, mud, peat, black cotton soil, soft shale, loose moorum, mixture of the above and similar material which could be excavated by ordinary application of picks and shovel, kodalo or any other ordinary digging tool.

Gravel or any other nodular material having maximum diameter not exceeding 75 mm in any direction shall also be covered in this category.

(b) Hard soil shall include:

material like stiff heavy clay, hard shale, compact moorum which could be excavated by extensive application of grafting tool or pickaxe or both and shovel,

gravel and cobble stones having maximum diameter between 75 mm and 300 mm in any direction,

existing soling surfaces of roads, paths, etc. when these surfaces are to be dismantled.

(c) Ordinary rock shall include:

lime stone,

sand stone,

laterite,

soft conglomerate when the blocks could be detached from the matrix by simply using the pickaxes,

soft or fissured rock which can be split/quarried with crowbars,

boulders having maximum diameter between 300 mm and 500 mm in any direction which are lying loosely on the ground or embedded in the river bed,

any rock which in dry state may be hard but in wet state becomes soft and manageable without much effort.

(d) Medium rock shall include:

rocks which do not necessarily require blasting but do require some efforts in breaking by chisels and hammers,

hard conglomerate,

boulders having maximum diameter above 500 mm in any direction which are lying loosely on the ground or embedded in the river bed,

any rock which in dry state may be hard but in wet state becomes comparatively manageable with a focused effort.

(e) Hard rock shall include:

rocks which require either blasting or intensive chiselling or use of mechanical plant.

When uncontrolled blasting is prohibited due to environmental reasons then the excavation of hard rock shall be carried out by

chiselling,

wedging,

tempering and any other standard method.

(f) Marshy soil shall include materials below ground level of marshes, swamps and other areas where continuous dealing with water is required.

2-1.3 Construction Operations

2-1.3.1 Setting Out

Limits of excavation shall be as per the construction drawings or as directed by the Engineer. The boundaries for excavation shall be set out as per the lines, curves, slopes, grades and sections given in the construction drawings.

Responsibility of carrying out this task shall be in accordance with the Clause G-9.

2-1.3.2 Stripping and Storing Top Soil

The layer of top soil (generally 150 mm) shall be stripped and stored at designated locations for reuse in roadside/embankment slopes, cut slopes, berms and disturbed areas where vegetation is desired. It should be confirmed that the entire organic substances are stripped out from the area under excavation or filling.

2-1.3.3 Excavation (General)

Excavation shall be carried out in conformity with the contract (Contractors) or the agreement (Users' Groups) and as per the directions of the Engineer. Wherever

possible, the excavated material shall be stock piled if they are found suitable for future use. Adequate precautions against soil erosion and water pollution shall be taken while planning or executing excavation.

The excavation shall be conformed with the lines, grades, side slopes and levels as given in the construction drawings or as directed by the Engineer. No excavation shall be carried outoutside the slopes andbelow the established grades by loosening any materials outside the limits of excavation.

Such excess excavation beyond the permissible limits shall be recovered from the Contractor/Users' Group or from their payment. Debris and loose materials on the slopes of cutting surfaces shall be removed.

No back filling shall be allowed to obtain the required slopes except when boulders or soft materials are encountered in cut slopes. The resulting cavities left over by the excavation of unsuitable materials shall be filled with suitable fill material and compacted as directed by the Engineer.

2-1.3.4 Rock Excavation

Rock in roadway excavation shall be removed up to the sub-grade level or as indicated in the construction drawings. Where unstable shales or other similar materials appear at the sub-grade level, they shall be excavated to the extent of 500 mm below the sub-grade level or even more to the satisfaction of the Engineer.

The rock excavation shall be carried out in such a manner that the rock protrudes shall not exist above the specified levels at any point. However, a negative tolerance of 150 mm could be allowed for the over-excavated portions.

Such over-excavated portions shall be recovered by hand packing of rubble and chips and by compacting them to the designed level. Slopes in rock cutting shall be finished to an uniform surface corresponding to the designed slope.

Where blasting is required, it shall be carried out in confirmation with clause 2 -2 and all necessary precautions shall be observed as indicated therein.

Where pre-splitting blasting is prescribed, it shall be carried out in confirmation with clause 2 -3.

2-1.3.5 Excavation of Marshy Land

Excavation of marshes/swamps shall be carried out as per the programme laid down by the Engineer.

Excavation of marshes shall begin at one end and shall proceed towards a single direction across the entire marsh. Back filling shall be carried out immediately after this operation.

All muck shall be completely removed and displaced,

from the area shown on the drawings or staked by the Engineer and

up to the firm base of the marshy land or to the level indicated by the Engineer.

2-1.3.6 Excavation of Road Shoulders for the purpose of pavement widening

During the widening of existing pavements,

The shoulders shall be excavated to the required width and level as shown on the drawings or as indicated by the Engineer.

The existing pavement which is supposed to be retained shall not be loosened or disturbed under any circumstances.

2-1.3.7 Excavation of Surface/Sub-surface Drains

Where the contract provides provisions for constructing surface/sub-surface drains (refer to clause 2 -9) the excavation shall be carried out according to the sequence which complies with the other works or is approved by the Engineer.

2-1.3.8 Removal of Slides

Slides, if occurred in cut slopes during construction, shall be removed at the cost of Contractor/Users' Group as per the instruction of Engineer.

If finished slopes slide into the roadway then such slides shall be removed by the Contractor/Users' Group at the contract rate/agreed rate for the class of excavation involved. This could be done only if the slides occurred due to a factor other than the low quality workmanship of the Contractor/Users' Group.

The classification of the slipped material shall be determined as per its condition at the time of removal. The payment shall be made accordingly regardless of its condition earlier.

2-1.3.9 Dewatering

If water is found during the excavation due to springs, sub-surface runoffs, rainfall or other causes then it shall be removed by suitable diversions, pumping or bailing out. However, the excavation shall be kept dry whenever required by the work or as directed by the Engineer.

Care shall be taken to discharge the drained water without causing damages to the completed works, crops and any other private or public property.

2-1.3.10 Disposal of Excavated Material

All the excavated materials shall be the property of either the government or DDC or VDC or the community.

Where the excavated material is identified for re-use for the construction of embankment then it shall be safely stored/piled up at a location as per the requirements given in clause 2 -5.

Excavation and disposal operations shall be arranged in such a way that the moisture content of soil should not be lost adversely during the process of cutting, hauling and compaction.

All hard materials such as hard moorum, rubble, etc. which are not intended for use in earth filling shall be stacked neatly for other uses such as pitching.

All excavated materials shall be disposed/piled up/stacked

on the land owned by the government/DDC/VDC/community or

in a location shown by the Engineer.

Unsuitable and surplus materials which are not intended for re-use shall be disposed as directed by the Engineer.

2-1.4 Plying of Construction Traffic

Construction traffic shall not use the cut formations without prior permission of the Engineer.

Any damage arising as a result of unauthorised traffic shall be re-built by the Contractor/Users' Group at their own expenses.

2-1.5 Preservation of Property

The Contractor shall undertake all reasonable precautions for the protection and preservation of any or all existing roadside trees, drains, sub-surface drains, pipes, conduits and any other structures under or above the ground which may be affected by construction operations and which, in the opinion of the Engineer, shall be continuously used without any change.

Contractor/Users' Group shall take adequate measures to safeguard the property and shall obtain prior approval of Engineer in such events.

Any damage caused by the negligence of Contractor/Users' Group shall be recovered or restored at their cost.

2-1.6 Preparation of Cut Formation

The cut formation shall be prepared as a foundation to sub-base/base course. It shall be carried out as per the drawings or as directed by the Engineer.

At sub-grade level, if the material is found with poor compaction then it shall be loosened to a depth of 500 mm and compacted in two layers (each of 250 mm) in accordance with clause 2 -5.

In rocky formation, the irregularities in the surface shall be corrected up to the specified elevation as shown in the drawings or as directed by the Engineer.

2-1.7 Finishing Operations

This work shall include proper shaping and dressing of all excavated surfaces. At no point, the finished surface shall vary from the designed slope by more than:

150 mm (measured at right angles to the slope) in the case of earth excavation and

600 mm (measured at right angles to the slope) in the case of rock excavation.

In no case, any portion of the side slopes shall encroach the roadway. The finished cut formation shall satisfy the surface regularity tolerances described in clause 5 -1.

The top soil removed earlier and conserved for re-use (as per clauses 2-1.3.2 and 2-5.3.2) shall be spread over cut slopes, filled slopes and other disturbed areas as directed by the Engineer.

If required, such slopes shall be roughened and moistened prior to the application of top soil. The top soil shall be spread as a layer of 75 mm to 150 mm thick.

2-1.8 Measurements for Payment

The quantities of roadway and drain excavation shall be measured by comparing the cross sections taken before the commencement and after the completion of works. These cross-sections should represent the same locations established in suitable intervals as per the ground profile.

Volumes are computed by the method of average end areas and are in cubic metres. At inaccessible and erratic locations, the volumes shall be computed by using other accepted methods. The Contractor/Users' Group could leave depth indicators during the excavation in order to indicate the original ground level as per the direction of the Engineer. The indicators shall not be disturbed until the final measurements are taken.

To determine the quantities of rock excavation, the cross-sections shall be taken after removing the overburden. Where the surface is irregular and when the material is admixed with other classes, the volumes shall be computed on the basis of stacked volume of material. In case of rock, 40% deduction of volume shall be made for the voids. In case of materials other than rock, this deduction shall be only 16% .

Quantities of work in the preparation of cut formation shall be measured in units indicated below:

loosening and re-compaction at sub-grade level : m3

removal of unsuitable materials : m3

replacement with suitable materials in place of removed unsuitable materials : m3

preparing rocky sub-grade : m2

stripping and storing of top soil : m3

reapplication of top soil : m2.

2-1.9 Rates

2-1.9.1 Contract Unit Rate for Roadway and Drain Excavation

The contract unit rate for roadway and drain excavation shall be paid in full for carrying out the operations required for the individual items including full compensation for: setting out transporting and depositing/stacking the excavated materials on sites of embankments or spoil banks (up to a lead of 50 m along the slope of lead route)trimming of excavated surfaces dewatering all abour, precautionary measures, incidentals which are necessary for the completion of work as per the Specifications wherever necessary a separate provisional rate shall be defined for pre-splitting work in rock excavation. It shall be worked out and paid as per clause 2-3.5.

2-1.9.2 Contract Unit Rate for Loosening and Re-Compacting at Sub-Grade Level

The unit rate for this work shall include full compensation for:

loosening of sub-grade soil to specified depth

breaking clods

spreading in layers

watering and

compaction.

2-1.9.3 Contract Unit Rates for Removal of Unsuitable Materials and Replacement with Suitable Materials

Unit rates for these items shall be the same as indicated in clauses 2-1.9.1 (for excavation) and 2-5.7.1 (for filling).

2-1.9.4 Contract Unit Rate for Preparing Rocky Sub-Grade

The unit rate for this item includes full compensation for:

providing, laying and compacting sub-base/base material as directed and

labour, incidentals and lead up to 50 m along the slope of lead route.

2-1.9.5 Contract Unit Rate for Stripping, Storing and Re-Application of Top Soil

It shall include full compensation for all necessary operations including lead up to 100 m along the slope of lead route.

2-1.9.6 Contract Unit Rate for Transporting Material from Excavation Sites

It shall include full compensation for all labour and incidentals on account of additional haul beyond the initial lead of 50 m along the slope of lead route.

2 -5 EMBANKMENT CONSTRUCTION

2-5.1 Description

These Specifications shall apply to the construction of embankments, shoulders and other miscellaneous filling and backfillng with approved materials obtained either from excavation of road construction or borrow pits or other sources.

All embankments shall be constructed in accordance with the requirements of these Specifications and in conformity with the lines, grades, cross sections shown on the construction drawings or as directed by the Engineer.

2-5.2 Materials

2-5.2.1 Physical Requirements

The materials used in embankments shall be earth, moorum, gravel, a mixture of these materials or any other material approved by the Engineer. The filling materials shall be free from logs, stumps, roots, debris and any other organic materials which affect the stability of the embankment.

Maximum particle size of the coarse material in the mixture of earth shall not exceed 75 mm. The Engineer may permit coarse material of larger sizes if he/she finds no difficulty as regards to the compaction of such material according to the Specifications.

In ordinary case, the filling materials shall satisfy the following requirements:

For the construction of embankment having a height of up to 3 m, the dry density shall not be less than 1.44 g/cm3.

For the construction of embankment having a height of over 3 m and if a part of its height is subjected to inundation for longer periods, the dry density shall not be less than 1.52 g/cm3.

For the construction of top 0.5 m of the embankment (or the road formation), the dry density shall not be less than 1.65 g/cm3.

However, the Engineer may waive these requirements depending upon the availability and the involved cost of such materials.

Clay materials which exhibit the properties like swell and shrinkage shall be filled at the bottom of the embankment so that it prevents any seepage through the embankment. No such material shall be placed or permitted at the top 0.5 m range which forms the sub-grade of road.

2-5.2.2 Source of Supply

The materials for embankment filling shall be obtained from the approved sources. Such sources could be nearby road excavation sites or any other excavation sites under the contract.

All borrow pits shall be approved by the Engineer. When obtaining the approval, the Contractor/Users' Group shall submit all required information such as location, expected quantity, quality of material, hauling distance and means of transportation to the Engineer. No borrow pit shall be opened without the permission of the Engineer.

Borrow pits shall not be opened continuously. At least every 300 m interval, there shall be a ridge of not less than 8 m width unopened. Small drains shall be excavated to facilitate drainage through the ridges.

The depth of the pits shall be regulated so that the maximum depth shall be limited to 1.5 m. No excavation shall be made below the imaginary slope line of 1:4 which connects the bottom of the borrow pit to toe of the embankment under construction.

The minimum distance between the borrow pit and the toe of the final section of the road embankment shall be 5 m.

2-5.3 Construction Operations

2-5.3.1 Setting Out

The site shall be cleared as per clause 1 -1. The work shall be set out as per clause 2-1.3.1.

Borders of the embankment shall be set out and pegged before the commencement of the earth filling. Batter pegs shall be fixed on both sides at regular intervals. The border pegs, desirably, shall be fixed about 0.5 m outside the actual limits of the fill and painted in a distinctive colour.

2-5.3.2 Stripping and Storing Top Soil

All top soil materials existing over the embankment foundation which are suitable for plant growth shall be stripped to specified depths not exceeding 150 mm and shall be stored for later use such as covering of embankment slopes, cut slopes and other disturbed areas where re-vegetation is desired.

2-5.3.3 Compacting Original Ground

The original ground shall be consolidated by rolling or effective ramming to the satisfaction of Engineer.

Where the height of the proposed embankment is less than 0.5 m and the original ground does not have a relative compaction of at least 95%, the original ground shall be loosened to a depth of 0.35 m (in addition to 0.15 m top soil layer),watered andcompacted to achieve 95% relative compaction. In normal circumstances, the required compaction could be achieved by a 8-10 t roller with a maximum of 6 passes or by a 1.5 t concrete roller with 12 passes. However, the Engineer shall confirm the final level of compaction.

Any unsuitable materials existing in the embankment foundation shall be removed and replaced by an approved material prior to compaction. Further filling work shall not be commenced until the foundation for embankment has been inspected by the Engineer.

2-5.3.4 Spreading the Materials in Layers and Maintaining the Optimum Moisture Content

The filling material shall be spread uniformly over the entire width of the embankment or the stretch under construction in layers not exceeding the loose thickness of 250 mm. Successive layers shall not be placed until the layer under construction has been well compacted to the requirements spelled out in these Specifications or contract document.

Moisture content of the filling material shall be checked at the source of supply. If it is found less than the Optimum Moisture Content (OMC), then the material shall be watered up to the required level at the source or after spreading as a loose layer at the construction site. The latter shall be recommended to follow since it spreads the water better than the former.

When sprinkling water over the loose soil layers, care should be taken to avoid any isolated flooding which makes the compaction operation difficult.

If the filling material is over-saturated than the OMC then it shall be dried by aeration or by exposing it to the heat of sun. However, the optimum moisture content shall be reached in order to achieve the desired compaction with lesser effort.

Owing to wet weather if the moisture content cannot be reduced to the required amount by the above procedures then all compaction operations shall be suspended.

Moisture content of each layer shall be checked and adjusted by compensating for evaporation losses. Generally, at the time of compaction the moisture content shall be kept within the range of 98% - 101% of the optimum moisture content.

In case of highly expansive soil, the moisture content shall be maintained at a value 2%-4% higher than the optimum moisture content.

After sprinkling the required amount of water, the soil shall be mixed by using harrows, rotary mixers or any other appropriate tools until the layer becomes equally wet.

Clods or hard lumps of earth shall be broken into pieces having maximum size of150 mm, when being placed in the lower layers of the embankment 60 mm, when being placed in the top 0.5 m range of the embankment.

Hauling vehicles and construction equipment shall be moved uniformly over the entire surface of the previously compacted layer in order to minimize rutting or uneven compaction.

When the embankment is required to be constructed across a low swampy area, the base of the fill shall be constructed by dumping successive loads of fill material consisting of larger soil particles. The thickness of the layer shall be uniform and just enough to hold the weight of hauling vehicles.

2-5.3.5 Compaction

The compaction equipment shall be approved by the Engineer after a demonstration exercise or trial compaction test which has been carried out by the Contractor in order to indicate the efficiency of the plants.

Each layer of the fill material shall be thoroughly compacted to the following degree of compaction (field dry density as a percentage of laboratory dry density at OMC) values:

not less than 98% for the top 0.5 m range of embankment.

not less than 95% for other portion of embankment.

85%-90% for highly expansive clay materials.

Subsequent filling shall be carried out only after the finished layer has been tested and accepted by the Engineer. When dry density measurements reveal any less compacted areas, further compaction shall be carried out as directed by the Engineer.

If the specified degree of compaction could not be achieved, then the material in the soft areas shall be removed; replaced by other suitable material and compacted again to achieve the required degree of compaction.

Consolidation : As an alternative to compaction operation, the filled embankment may be left for consolidation by nature. For this, the embankment shall be kept for at least one monsoon.

When no roller is available for compaction, manual ramming could also be used as another alternative.

2-5.3.6 Drainage

During construction time, the surface of the embankment shall be kept free from stagnated water by providing adequate cross-falls and other drainage facilities.

2-5.3.7 Finishing Operations

The finishing operations shall include the work of shaping and dressing of shoulders, road base, side slopes in accordance with the levels, cross-sections and dimensions given in the drawings or as directed by the Engineer. However, the surface tolerances shall be observed as per clause 5 -1.

To improve the appearance and to merge the embankment with the adjacent terrain both the upper and lower ends of the side slopes shall be rounded off.

The top soil, removed and conserved earlier (refer to clause 2-1.3.2 and 2-5.3.2) shall be spread over the fill slopes in order to facilitate the growth of vegetation. Prior to the application of top soil, the side slopes shall be roughened and slightly moistened in order to have a satisfactory bond between the layers. The depth of the top soil shall be sufficient enough to sustain the plant growth. The usual thickness of top soil spread is 75 - 150 mm.

Wherever possible, the slopes shall be turfed with sods in accordance with clause 2 -7. If prescribed in the contract, the seeding and mulching of slopes shall be done as per the requirements of clause 2 -8.

When earthwork operations have been substantially completed, the roadway area shall be cleared of all debris and ugly scars.

2-5.4 Embankment Construction under Special Conditions

2-5.4.1 Earthwork for Widening of Existing Road Embankments

If the slopes of the existing embankment are steeper than 4:1 then, horizontal benches of 0.3 m width shall be cut across slope line starting from toe of the embankment. Filling shall be carried out in 250 mm thick layers progressing from the toe level up to the top level of the embankment. All layers shall be watered and compacted to achieve the required degree of compaction. The material obtained from cutting of benches could also be utilised for this operation.

When the existing slopes of the embankment are flatter than 4:1 then the slope surface may only require ploughing or scarifying and no bench cutting is necessary. However, filling shall be carried out in 250 mm thick horizontal layers as described above.

Where the width of the widened portion is insufficient for the use of roller, mechanical or manual tampers shall be used for compaction. Wherever possible, end dumping of material from hauling vehicles shall be avoided.

2-5.4.2 Construction of Earth Embankments on Sloping Ground

Where an embankment needs to be constructed on sloping ground, the ground surface shall be appropriately benched or ploughed and scarified as indicated in clause 2-5.4.1 before the commencement of filling. If required, the construction of lateral sub-surface drains shall be carried out at the cut-fill interface as per clause 2 -9.

2-5.4.3 Earthwork over Existing Road Surfaces

If the existing road surface is granular or bituminous and a new road surface is supposed to be constructed within 1 m range of height above the old one, then the existing road surface shall be scarified to a minimum depth of 50 mm for proper bondage between fill and the old formation.

If the existing road surface is of cement concrete and a new road surface is supposed to be constructed within 1 m range of height above the old one, then the existing pavement shall be removed completely prior to filling operation.

If the level difference between the existing and the new road surface is more than 1 m, then the existing surface may not be required to be scarified or removed.

2-5.4.4 Embankment filling around Structures

Earth work on embankment shall be suspended at points forming approaches to structures such as abutments, wing wall, return walls until the structure is fully set.

The filling around culverts, bridges and other structures up to a distance of twice the height of the embankment at abutment shall be carried out independently from the filling

on main embankment. Such back filling shall not be carried out near to any structural component until such component is being cured for 14 days.

The embankment shall be raised simultaneously in equal layers placed on either side of the structural component. The sequence of such work shall be approved by the Engineer in advance.

The material used for back filling shall not be organic or high plastic clay having plasticity index of more than 20 and liquid limit of more than 40. The fill material shall be deposited in horizontal layers not exceeding a loose thickness of 150 mm. These layers shall be compacted as per clause 2-5.3.5.

If specified in the contract, a filter medium material could be used behind the structural component in order to reduce the pore water pressures on it. Such filter material shall be laid in layers simultaneously, in line with the other layers of fill material.

The compaction can be carried out by mechanical or manual tampers or by other methods approved by the Engineer. Care shall be taken to avoid any damages to the built structural components.

2-5.5 Plying of Construction Traffic

Construction traffic shall not use the prepared surface of the embankment without prior permission of the Engineer. Any damage caused as a result of such use shall be rectified by the Contractor/Users' Group at their own cost.

2-5.6 Measurements for Payment

Earth embankment construction shall be measured by taking cross sections in the original position before the work starts and in the final position after its completion.

Volumes of earthwork shall be computed by the method of average end areas and be given in cubic metres.

The measurement of fill material from borrow areas shall be the difference between the net quantities of compacted fill and the net quantities of suitable material brought from road way and drainage excavation. It shall be assumed that one cubic metre of suitable material brought to site from roadway and drainage excavation forms one cubic metre of compacted fill if the measurement has already been done under the item of excavation. Since the measurement was taken for undisturbed earth prior to excavation, no allowance for any shrinkage/bulging shall be made.

Stripping of top soil including its storing and reapplication shall be measured in cubic metres.

Work which involves loosening and re-compacting of original ground surface shall be measured in square metres.

In preparing foundations for embankments, works such as removal of unsuitable material from the base, its replacement with suitable material shall be measured as individual items in cubic metres.

Scarifying existing granular/bituminous road surfaces shall be measured in square metres. Dismantling and removal of existing cement concrete pavement shall be measured in cubic metres as per clause 1-2.6.

Preparation of filter media adjacent to the structural components shall be measured as finished work in cubic metres.

2-5.7 Rates

2-5.7.1 Contract Unit Rate for Construction of Embankment or Filling of Sub-Grade

The contract unit rate for the items of construction of embankment and filling of sub-grade shall be paid in full for carrying out the required operations including full compensation for:

setting out,

compacting original ground,

scarifying or cutting continuous horizontal benches of 0.3 m width on side slopes of existing embankments where required,

compaction to specific requirements,

shaping and dressing the top and slopes of embankment including rounding off the corners,

back filling at structures,

widening works of embankments,

excavation of all materials from designated borrow areas and transporting them to site up to a lead of 50 m along the slope of lead route, and

all labour, materials and incidentals necessary to complete the work as per the Specifications.

2-5.7.2 Contract Unit Rate for Transporting Materials Required for Embankment Construction

This unit rate shall be paid in full to compensate for labour and incidentals necessary on account of the additional haul or transportation involved beyond the initial lead of 50 m.

2-5.7.3 Contract Unit Rate for Stripping and Storing or Reapplication of Top Soil

This contract unit rate covers either storing or reapplication. Refer to clause 2-1.9.5 in this regard.

2-5.7.4 Contract Unit Rate for Loosening and Re-Compacting the Embankment Foundations

Clause 2-1.9.2 shall apply.

2-5.7.5 Contract Unit Rates for Removal of Unsuitable Materials and Replacement with Suitable Materials

Clauses 2-1.9.1 and 2-5.7.1 shall apply for removal and replacement, respectively.

2-5.7.6 Contract Unit Rate for Scarifying Existing Granular/Bituminous Road Surfaces

This rate shall cover the carrying out of required operations including full compensation for all labour, materials, safety precautions and incidentals necessary to complete the work as per the Specifications. It shall also cover handling, salvaging, stacking and disposing of the dismantled materials up to a lead of 100 m along the slope of lead route.

2-5.7.7 Contract Unit Rate for Dismantling and Removal of Cement Concrete Pavements

Clause 1-2.7 shall apply.

2-5.7.8 Contract Unit Rate for Preparing Filter Media adjacent to Structural Components

This rate shall cover the carrying out of required operations including full compensation for materials, labour and incidentals required to complete the work as per the Specifications.

Gabion *works* *(as per DoLIDAR-Tech. Spec. for LBCWARR Clause No. 17-1.4, 17-5 & 17-6)*

17-1.4 Laying GI Wire Crates (Gabion) and Mattresses in the Apron

The crates shall be made from 5 mm galvanised iron wire. The mesh of the crate shall not be more than 150 mm.

Wire crates for shallow or accessible situations shall be 3 m x 1 m x 0.5 m in size. Where there is a chance of overturning, the crate shall be divided into 1.5 m compartments by cross netting.

For deep or inaccessible situations, wire crates can be made smaller subject to the approval of the Engineer.

Wire crates built in-situ shall not be larger than 3 m x 1 m x 1 m nor smaller than 2 m x 1 m x 0.3 m. Sides of large crates shall be securely stayed at intervals of not more than 1.5 m to prevent bulging.

The netting shall be made by fixing a row of spikes on a beam at spacing equal to the mesh. The beam must be a little longer than the width of netting required. The wire is to be cut to lengths about three times the length of the net required. Each piece is bent at the middle and circled around one of the spikes. Then, the weaving shall commence from one corner.

A double twist shall be given at each intersection. This twisting shall be carefully done by means of a strong iron bar. In twisting, 5 half turns shall be given to the bar at each splice.

The bottom and two ends of the crate or mattress shall be made at one time. The other two sides shall be made separately and shall be secured to the bottom and to the ends by twisting adjacent wires together. The top of the crate shall be made separately. It shall be fixed in the same manner as the sides after the crate or mattress has been filled with stones.

Wherever possible, crates shall be placed in position before filling with boulders. The crates shall be filled carefully by hand-packing of the boulders as tightly as possible. Mere throwing of stones or boulders shall not be permitted.

17-5 Measurements For Payment

The protection works shall be measured as described below:

If directed by the Engineer, the materials may have to be stacked at site for measurement before laying. No extra payment shall be made to the Contractor for such stacking.

The boulders and wire crates (gabion) in apron shall be measured in cubic metres.

The filter and stone pitching shall be measured separately in cubic metres, unless otherwise specified.

Rubble stone flooring and cement concrete bedding shall be measured in cubic metres for each class of material.

Brick flooring shall be measured in square metres for one or two layers as specified.

Preparation of base for laying the flooring shall be deemed incidental to the work.

For laying apron, excavation up to an average depth of 15 cm shall be deemed to be included in the main item and shall not be measured separately, unless otherwise specified. Excavation for more than 15 cm depth shall be measured in cubic metres as given in clause 2 -4.

17 -6 Rate

The contract unit rate for one cubic metre of finished work of apron shall include the cost of all labour, materials required to complete the work as per the Specifications. Excavation up to an average depth of 15 cm shall also be deemed to be included in this rate as dressing of the bed. Excavation beyond this depth shall be paid separately, unless otherwise specified.

The contract unit rate for one cubic metre of filter or stone pitching on slopes shall include the cost of preparing the base; placing materials to the profile; laying and compacting the filter; and stone pitching of dry rubble/brick revetment for embankment slopes to the specified thickness, lines, curves, slopes and levels including the cost of all labour, materials required to complete the work as per the Specifications.

The contract unit rate for rubble stone/brick flooring shall include the cost of all labour and materials required to complete the work as per the Specifications and drawings.

Gabion Works–DOR, SSRBW-2001 clause 2400

(1) Scope

This Clause covers the furnishing of materials and construction of gabion works that may be required to act as buttresses, retaining walls, catch wall, stream or river training structures, check dams within gullies, or where placed as mattresses, to prevent stream or gully erosion.

(2) Materials

(a) Stone

Stones used for filling the gabion boxes or mattresses shall be clean, hard, sound, unweathered and angular rock fragments or boulders. The specific gravity of the stone shall be not less than 2.50 and the stones shall not absorb water more than 5 percent when tested as per IS: 1124. The length of any stone shall not exceed three times its dimension of the mesh of the crate. However smaller size of stones as spalls shall be allowed for filling voids and its volume including voids shall not be more than 20 percent of the total volume of the stone. Before filling any gabion boxes and mattresses the Contractor shall submit representative samples of the rock he proposes to use in the gabion for approval by the Engineer. Further representative samples shall be submitted for approval each time when there is a change in the type and strength of the rock.

(b) Gabion

Gabions shall consist of steel wire mesh crates. The steel wire shall be mild steel wire complying with NS 169-2045. All wires used in the manufacturing crates and diaphragms, binding and connecting lids and boxes shall be galvanized with an heavy coating of zinc by an electrolytic or hit dip galvanizing process. The weight of deposition of zinc shall be in accordance with NS 163-2045. Zinc coating shall be uniform and be able to withstand minimum number of dips and adhesion test specified as per NS 163-2045. Tolerance on diameter of wire shall be ± 2.5 percent. The tensile strength shall be between 300 to 550 N/mm^2

The wire shall be woven into an hexagonal mesh with a minimum of 3 twists. All edges of the crates shall be finished with a selvedge wire at least 3 gauges heavier than the mesh wire. Gabions shall be manufactured in the standard sizes shown in Table 24.1 with mesh and wire sizes as shown in Table 24.2

Diaphragms shall be manufactured of the same materials as the parent gabion box and shall have selvedge wire throughout their perimeter. The number and

size of diaphragms to be provided with each crate shall be as in Table 24.1. All crates shall be supplied with binding and connecting wire of the gauges shown in Table 24.2 of sufficient quantity to bind all diaphragms and closing edges.

Table 24.1: Standard Size of Wire Mesh Gabions

Dimensions in Meters (Prior to fill)	Number of diaphragms	Dimension of diaphragms in metres	Volume of crate in cubic metres
1 x 1 x 1	-	-	1
1.5 x 1 x 1	1	1 x 1	1.5
2 x 1 x 1	1	1 x 1	2
3 x 1 x 1	2	1 x 1	3
1 x 1 x 0.75	-	-	0.75
2 x 1 x 0.75	1	1 x 0.75	1.5
3 x 1 x 0.75	2	1 x 0.75	2.25
1 x 1 x 0.5	-	-	0.5
2 x 1 x 0.5	1	1 x 0.5	1
3 x 1 x 0.5	2	1 x 0.5	1.5
1 x 1 x 0.3	-	-	0.3
2 x 1 x 0.3	1	1 x 0.3	0.6
3 x 1 x 0.3	2	1 x 0.3	0.9

Table 24.2: Standard Size of Mesh and Wire in Gabions

Mesh opening mm	Mesh type	Thickness of mesh wire	Thickness of binding and connecting wire	Thickness of selvedge wire
(DxH)		S.W.G.	S.W.G.	S.W.G.
64 x 83	60 x 80*	11, 12	13, 14	8, 9
83 x 114	80 x 100	9, 10, 11	11, 12, 13	6, 7, 8
114 x 128	100 x 120	10, 9	12, 11	7, 6

** To be used in special cases subject to approval by the Engineer where stone of larger size are not available.*

Note: Equivalent diameter in mm as per NS 163-2045

SWG	6	7	8	9	10	11	12	13	14
Mm	4.88	4.75	4.06	3.66	3.25	2.95	2.64	2.34	2.03

(3) Construction of Gabion

(a) General Requirements

Before filling any gabion boxes and mattresses, the Contractor shall submit samples of gabion boxes and/or gabion mattresses assembled, erected and filled with stones for approval which, when approved, shall be retained for reference and comparison with the gabions built as part of the permanent works. The size, type and location of the samples shall be as directed by the Engineer.

Gabion boxes and gabion mattresses shall be assembled, erected and filled with stones in the dry on prepared surfaces except as may be otherwise approved. Approval for assembling and erecting gabions in water shall be given only, if in the Engineer's opinion such a method will produce work which is otherwise in accordance with the Specification.

(b) Preparation of Foundation and Surface for Bending

The bed on which the gabion boxes or mattresses are to be laid shall be even and conform to the levels shown on the Drawing. If necessary cavities between rock protrusions shall be filled with material similar to that specified for gabion filling.

(c) Arrangement of Joints

(i) Walls

In walls gabion boxes shall be placed such that vertical joints are not continuous, but staggered. Aprons shall be formed of headers. If more than one unit is required to obtain the necessary width, unit of unequal length shall be used and the joints between should be staggered.

(ii) Channel linings

In channel linings, gabion box and mattress units shall be laid so that the movement of stone inside the mesh due to gravity or flow of water is avoided. Hence, on side slopes, unit shall be placed with their internal diaphragms at right angles to the direction of the slope and, on inverts, as far as possible, at right angles to the direction of flow.

(d) Assembly

Gabion boxes and gabion mattresses shall be assembled on a hard flat surface. After fabrication, unpacking or unfolding, they shall be stretched out and any kinks shall be removed. Creases shall be in the correct position for forming the boxes or mattress compartments. The side and end panels shall be folded into an upright position to form rectangular boxes or compartments. The top corners shall be joined together with the thick selvedge wires sticking out of the corners of each panel. The tops of all sides and partitions shall be leveled except as may be appropriate to special units. The sides and end

panels shall be tied together using binding wire of the thickness given in Table 24.2, starting at the top of the panel by looping the wire through the corner and twisting the wire together. Binding shall continue by looping the wire through each mesh and around both selvedges with three rounds which shall be joined tightly together by twisting and the end shall be pocked inside the unit. The diaphragms shall be secured in their correct positions by binding in the same way. The bindings wire shall be fixed using 250 mm long nose fencing pliers or equivalent approved tools.

The gabion boxes and gabion mattresses shall be laid in such a manner that the hinges of the lid will be on the lower side on slopes and on the outer side in walls.

Where mattresses are laid horizontally hinges shall not be placed on the downstream side as much as practicable.

(e) Filling

Except in the case of sack gabions, the crates shall be placed in their final position before filling commences. They shall be stretched to their full dimension and securely pegged to the ground or wired to adjacent gabion before filling. The vertical corners shall be kept square and to full dimension by inserting a steel bay of at least 20 mm diameter at each vertical corner, maintaining it in the correct final position throughout the filling process, and removing it when the crate is full. Before filling commences, the selvedges of the crate shall be bound to the selvedges of adjacent crates with binding wire. Where crates are being assembled in position in a wall the binding of the edges of each crate n the assembly process and the binding together of adjacent crates shall be carried out in the same operation.

Before filling with stone, gabion shall be anchored at one end or side and stretched from the opposite end or side by inserting temporary bars and levering them forward. The top and bottom shall be kept stretched by tensioning with tie wires attached to an anchorage or equivalent approved method until the gabion has been filled. The gabions shall be inspected at this stage but before filling with stone to ensure that the tie/wiring has been properly carried out and the gabion boxes or gabion mattresses are not pulling apart. Gabion boxes or gabion mattresses may be tensioned either singly or in the case of a long straight structure by staining a number of units together using an approved tensioning system.

The filling shall be carried out by placing individual stones into the gabion by hand in courses in such a manner that the stones are bedded on each other and bonded as in dry random rubble masonry as per Clause 2608. No loose stones shall be tipped into the crate and the practice of coursing and bonding the outer layer and filling the interior with unlaid stones shall not be permitted.

All 1m deep gabions shall be filled in three equal layers and 0.5 m deep gabions in two equal layers. Horizontal bracing wires made with the same bindings wire as used for tying shall be fixed directly above each layer of the stone in the compartments, the wires being looped round two adjoining meshes in each side of the compartment and joined together to form a double tie which shall be tensioned by wind lassing together to keep the face of the gabions even and free from bulges. Bracing wires shall be spaced horizontally along and across the gabions at distances not greater than 0.33 m. Where the upper faces of gabion boxes are not covered with further gabions vertical bracing wires shall be fitted between the top and bottom mesh using two tie wires per square metre of surface.

The ties shall be fixed to the bottom of the units prior to filling and tied down to the lid on completion. Where a double layer of gabion boxes is used to form an apron both upper and lower layers shall have vertical tie wires.

(f) Securing Lids

The gabion boxes and mattress compartment shall be over filled by 50 mm above their tops to allow for subsequent settlement. The lids shall then be tied down with binding wire to the tops of all partition panels. The lids shall be stretched to fit the sides exactly by means of suitable tool but due care shall be taken to ensure that the gabions are not so full that the lids are overstretched. The corners shall be temporarily secured first.

(g) Tolerance

On completion, the crates shall be completely and tightly filled, square, true to dimensions and the line and level shown on the Drawing. However the tolerance limit permitted in the length, height and width of the gabion boxes and mattresses as manufactured shall be ± 3 percent from the ordered size prior to filling. The tolerances on the wire mesh opening shall be ± 10% on the nominal dimension 'D' values as follows:

Mesh Type	**Nominal dimension 'D' values**
60 x 80	64
80 x 100	83
100 x 120	114

Dimensions are measured at right angles to the center axis of the opening and parallel to the twist along the same axis.

However, the number of opening per gabion box/mattress shall not be less than the nominal length divided 'D' on horizontal direction and nominal height divided by 'H' in vertical direction where D and H are per Table 24.2.

(4) Test and Standard of Acceptance

(a) The gabion wire shall be tested for mass, uniformity and adhesion of zinc coating and tensile strength of the wire itself. Failure of test results to comply with the specifications shall lead to the rejection of gabion wires. The test on the samples taken as per Table 24.3 from each lot of the G.I. wire received at the side of the work shall be carried out in accordance with NS 169-2045 and NS 163-2045.

Table 24.3: Scale of Sampling and Permissible Number of Defective

No. of coils in a lot	**No. of coils randomly selected for sampling***	**Permissible no. of defective coil**
Upto 25	2	0
26-50	3	0
51-150	5	0
151-300	8	1
300 and above	13	1

**One sample per coil shall be tested in all respect*

(b) The stones shall be tested for specific gravity and water absorption. At least 3 set of tests shall be made for every source of material. The test results shall meet the specified criteria.

(c) In each two hundred cu.m. or part thereof one representative sample of completed gabion box mattress i.e. assembled, filled with stones and tied up in position shall be dismantled during the process of construction. The dismantling shall be made in such a manner that the quality of the surrounding work is least affected. The stones having least dimension more than or equal to the specified dimension shall be gathered at one place and the rest at another place. By displacement of water total volume of these specified stones shall be determined separately. Ratio of volumes of specified stone and voids including spalls to the volume of the total volume of the gabion box shall be worked out. The test result shall meet the requirement of the Specifications.

(d) The dismantled portion shall be made good by the Contractor at his own cost after completion of the test.

(5) Measurement

Gabion wire mesh for boxes and mattresses shall be measured in sq. metre. The boxes and mattresses shall be physically measured and be verified with their tolerances.

The binding wires, selvedge wire and tension wires shall not be measured separately. They are deemed included in the measurement of the gabion boxes and/or mattresses.

Stone filling in gabions including fixing of gabion in position, tying with binding wires and tension wires as specified shall be measured in cu.m.

(6) Payment

Gabion boxes, gabion mattresses, stone filling shall be paid as per respective contract unit rate which shall be the full and the final compensation to the Contractor as per Clause 112 to complete the work in accordance with these Specifications.
Following clauses is added for Machine Made Gabion Boxes

2401 Specification for machine made Gabion Boxes

Specification of Machine made Gabion Boxes and Wires:

The gabion boxes shall be fabricated with machines using galvanised iron (GI) wires. The GI wire shall be mild steel wire complying with NS 169-2045. All wires used in the manufacturing crates and diaphragms, binding and connecting lids and boxes shall be galvanised with an heavy coating of zinc by an electrolytic or hot dip galvanising process. The weight of deposition of zinc shall be in accordance with NS 163-2045. Zinc coating shall be uniform and be able to withstand minimum number of dips and adhesion test specified as per NS 163-2045. Tolerance of diameter of wire shall be **+/- 2.5% percent**. The tensile strength shall be **380 to 500 N/mm^2.**

No. of coils in a lot	**No. of coils randomly selected for sampling***	**Permissible no. of defective coil**
Up to 25	2	0
26-50	3	0
51-150	5	0
151-300	8	1
300 and above	13	2

The wires shall be mechanically woven into hexagonal mesh of size 100mm*120mm (as shown in the following figure 1) with a minimum of double twists. The tolerance limit permitted in the length, height and width of boxes shall be **+/- 3% percen**t. The tolerances on the wire mesh opening shall be **+/- 5 % percent.** All edges of the boxes shall be finished with a selvedge wire. The diameter of the wires shall be as specified below:

Wire Type	Diameter in mm
Mesh	3
Selvedge	3.9
Binding	2.64

Diaphragms shall be manufactured from the same materials as the parent gabion box and shall have selvedge wire throughout their perimeter. The number and size of diaphragms to be provided with each crate shall be as per the following table:

Box Size in metres	Number of Diaphragms	Size of Diaphragm in metres
2x1 x1	1	1 x1
1.5x1 x1	1	1 x1
3x1 x1	2	1 x1
3x1x1	2	1x0.5
2x1x0.5	1	1x0.5

Gabion boxes shall be manufactured with all components mechanically connected at the production facility. All crates shall be supplied in collapsed form, folded and bundled. The bundles shall be compressed and strapped together at the factory for easy shipping and handling. Binding (lacing) wires shall be supplied in coils. Every bundle of boxes shall bear a tag marking **manufacturer's name, size of the box and production batch no. of wire coils used.** The Supplier shall furnish manufacturer's test certificates for each batch of production of wires with regard to zinc coating and tensile strength tests.

Test and Standard of Acceptance

The gabion wire shall be tested for mass, uniformity and adhesion of zinc coating and tensile strength of the wire itself. Failure of test results to comply with the specifications shall lead to the rejection of gabion boxes and/or wires. The test on the samples taken as per Table given below from each lot of the G.I. wire received at the final delivery site shall be carried out in accordance with NS 169-2045 and NS 163-2045.

With regard to test for binding wires, the following scale of sampling and permissible number of defective coil shall be applied:

One sample per coil shall be tested in all respect.

Regarding the test for mesh and selvedge wires, the Purchaser may take some samples of wires (mesh and selvedge) kept aside at factory for fabricating boxes to be supplied under the contract. In addition, the Purchaser may take samples of wires from the woven gabion crates supplied at final delivery site to ascertain whether the same batch of wires (from which samples are taken at factory) have been used in fabricating boxes. The gabion wire

so taken shall be tested for zinc coating mass, uniformity and adhesion of zinc coating. The scale of sampling and permissible number of defective crates shall be as specified below:

No. of boxes in a lot	No. of boxes randomly selected for sampling*
Up to 3000 boxes	2
More than 3000 boxes	3

Stone Masonry -*DoLIDAR-Tech. Spec. for LBCWARR Clause No. 8*

Masonry Walls (as per DoLIDAR-Tech. Spec. for LBCWARR Clause No. 8)

8.0 Stonemasonary for structure

8 -1 Materials

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

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

The length of stone shall not exceed 3 times of its height. The breadth of stone at base shall be neither greater than three fourths of the thickness of wall nor less than 15 cm.

Other materials used in stone masonry shall conform to the requirements given in Section 6 of the Specifications.

Mortar used in stone masonry shall conform to the requirements specified in clause 7 -1.

8 -2 Type Of Masonry

The type of masonry used for structures shall be random masonry (coursed or un-coursed) or coursed rubble masonry (First or Second sort). The actual type of masonry used for different parts of structures shall be specified in the drawings. If specified in the drawings, ashlar masonry shall be used for facing work.

8 -3 Construction Operation

8-3.1 General Requirements

The dressing of stone shall be as specified for individual type of masonry work. It shall also conform to the general requirements for dressing of stone covered in IS : 1129 until similar Nepal's Standards are in place. Other specific requirements are covered separately with respect to various types of rubble stone work.

Stone shall be sufficiently wetted before laying in order to prevent any absorption of water from the mortar. The bed for each layer of stones shall be cleaned, wetted and covered with a layer of fresh mortar. All stones shall be laid full in mortar both in bed and in vertical joints and settled carefully in place with a wooden mallet immediately after placing so that they are solidly bedded before the mortar is set. Clean chips and spalls shall be wedged into the mortar joints and beds wherever necessary, to avoid thick beds or joints of mortar. Whenever foundation masonry is laid directly on the rock, the face stones of the first course shall be dressed to fit into the rocks snugly when pressed down in the mortar bedding over the rock. No dry or hollow space shall be left any where in the masonry. Each stone shall have all the embedded faces completely covered with mortar.

Courses of the masonry shall ordinarily be pre-determined. They shall generally be of the same height. Where there are variations in the height of courses, larger courses shall be placed at the lower levels with height of courses decreasing gradually towards the top.

Vertical joints shall be staggered as far as possible.

All necessary chases for joggles, dowels and cramps shall be formed in the stones beforehand. Sufficient transverse bond shall be provided by the use of bond stones extending from the front to the back of the masonry. In case of thick walls, bond stones shall overlap in their arrangement. Bell shaped bond stones or headers shall not be used.

At all angular junctions, stones at each alternate course shall be well bonded into the respective course of the adjacent wall. As far as possible, all connected masonry in the structure shall be carried out at one uniform level throughout. When breaks are unavoidable, the masonry shall be raked in sufficient long steps to facilitate proper jointing of new work with the old. The stepping of raking shall not be more than 450 with the horizontal. Wing walls, abutments and piers, etc. shall be carried out true to the plumb or to the specified batter.

Face work and hearting shall be brought up evenly. The top of each course, however, shall not be levelled up by use of flat chips.

8-3.2 Random Masonry (Coursed and Un-coursed)

8-3.2.1 Dressing

Stone shall be hammer dressed on the face, sides and beds in order to bring it in contact with adjacent stones. The bushing on the face shall not be more than 4 cm on exposed face.

8-3.2.2 Insertion of Chips

Chips and spalls of stone may be used wherever necessary to avoid thick mortar beds and joints. It shall be ensured that no hollow space is left anywhere in the masonry. The chips shall not be used below hearting stones as an attempt to bring them up to the level of face stones. Use of chips shall be limited to the filling of interstices between the adjacent stones during the process of hearting. However, they shall not exceed 20% of the quantity of stone masonry.

8-3.2.3 Hearting Stones

The hearting or interior filling of wall face shall consist of rubble stones not less than 15 cm in any direction. They shall be carefully laid; hammered down with wooden mallet into position; and solidly bedded in mortar. The hearting stones should be laid such that the stones are nearly level with facing and backing stones.

8-3.2.4 Bond Stones

Through bond stones shall be provided in masonry up to 60 cm thickness. In case of masonry having thickness of above 60 cm, a set of two or more bond stones which overlap by at least 15 cm shall be provided along a line from face to back. In case of highly absorbent types of stones (porous limestone and sandstone), the bond stone shall extend only about two-third into the wall, as through stones may give rise to penetration of dampness. Therefore, a set of two or more bond stones which overlap by at least 15 cm shall be provided for all thickness of such masonry. One bond stone or a set of bond stones shall be provided for every 0.50 square metres of the masonry surface.

8-3.2.5 Quoin Stone

Quoin stone is a specially selected stone which shall be neatly dressed to form an internal angle in masonry work. Its size shall not be smaller than 0.03 cubic metre in volume.

8-3.2.6 Plum Stone

The plum stones are selected long stones which shall be embedded vertically in the interior of masonry in order to form a bond between successive courses. It shall be provided at interval of about 90 cm.

8-3.2.7 Laying

The masonry shall be laid with or without courses as specified. The quoins shall be laid as header and stretcher, alternately. Every stone shall be fitted to the adjacent stone in order to form neat and close joint. Face stone shall extend and bond well in the back. This shall be arranged to break joints, as much as possible, and to avoid long vertical lines of joints.

8-3.2.8 Joints

The face joints shall not be more than 20 mm thick, but shall be sufficiently thick to prevent stone-to-stone contact and shall be completely filled with mortar.

8-3.3 Dry Rubble Masonry for Retaining Walls

This work shall conform to clause 8-3.2 of Random Masonry (Un-coursed) except that

i. the masonry shall be dry without mortar;
ii. the spaces between large stones shall be filled with spalls as tightly as possible;
iii. the foundations shall be excavated at right angle to the face batter (not horizontally). Similarly, beds of the stones shall also be laid at right angle to the face batter.

8-3.4 Square Rubble-Coursed Rubble Masonry (First sort)

8-3.4.1 Dressing

Face stones shall be hammer dressed on all beds and joints in order to give them rectangular shape as much as possible. The face stone shall be square on all joints and beds. The bed joints shall be chisel drafted for at least 8 cm back from the face and for at least 4 cm for the side joints. No portion of the dressed surface shall show a gap of more than 6 mm depth from the straight edge placed on it. The remaining unexposed portion of the stone shall not project beyond the bed and side joints. The requirements regarding bushing shall be the same as for random rubble masonry.

8-3.4.2 Hearting Stone

The hearting or interior filling of the wall shall consist of flat bedded stone carefully laid on their proper beds in mortar. The use of chips shall be limited to the filling of interstices between the adjacent stones during the process of hearting. However, they shall not exceed 10% of the quantity of masonry. While using chips, it shall be ensured that no hollow spaces are left anywhere in the masonry.

8-3.4.3 Bond Stones

The requirements regarding through or bond stones shall be the same as for random rubble masonry but, these shall be provided at a clear distance of 1.5-1.8 m apart in every course.

8-3.4.4 Quoin Stone

The quoins which are of the same height as the course shall be formed as header having a length of not less than 45 cm. They shall be laid length-wise alternately along each face, square in their beds, which shall be fairly dressed to a depth of at least 10 cm.

8-3.4.5 Face Stones

Face stone shall tail into the work for not less than their heights. Furthermore, at least one-third of the face stones shall tail into the work for a length not less than twice their height. These shall be laid headers and stretchers, alternately.

8-3.4.6 Laying

The stones shall be laid on horizontal courses and all vertical joints shall be truly vertical. The quoin stones shall be laid stretchers and headers, alternately. These shall be laid square on their beds which shall be rough chisel dressed to a depth of at least 10 cm.

8-3.4.7 Joints

The face joints shall not be more than 10 mm thick but shall be sufficiently thick to prevent stone to stone contact. Such joints shall be completely filled with mortar.

8-3.5 Square Rubble-Coursed Rubble Masonry (Second sort)

8-3.5.1 General

All the requirements are the same as of Coursed Rubble Masonry (First sort) except that no portion of dressed surface joints shall show a gap of more than 10 mm depth from a straight edge placed on it. Use of chips in the process of hearting shall not exceed 15% of the quantity of stone masonry.

8-3.5.2 Joints

The face joints shall not be more than 20 mm thick but shall be sufficiently thick to prevent stone to stone contact. Such joints shall be completely filled with mortar.

8-3.6 Ashlar Masonry (Plain Ashlar)

8-3.6.1 Dressing

Every stone shall be cut to the required size and shape, and chisel dressed on all beds and joints in order to be free from bushing. Dressed surface shall not show a gap of more than 3 mm depth from straight edge placed on it. The exposed faces and joints shall be fine tooled so that a straight edge can be laid along the face of the stone in contact with every point. All visible angles and edges shall be true and square and free from chippings. The corner stones (quoins) shall be dressed square and the corner shall be straight and vertical.

8-3.6.2 Bond Stones

Through bond stones shall be provided in masonry up to 60 cm thick. In case of masonry above 60 cm in thickness, a set of two or more stones which overlap by at least 15 cm shall be provided in a line from face to back. In case of highly absorbent type of stones (porous lime stone and sandstone), the bond stone shall extend about two third into the wall, as through stones may give rise to penetration of dampness. Hence, for all thickness of such walls, a set of two or more bond stones which overlap by at least 15 cm shall be provided. Each bond stone or a set of bond stones shall be provided at a clear distance of 1.5-1.8 m apart in every course.

8-3.6.3 Laying

The face stones shall be laid header and stretcher, alternately. The headers are so arranged to be positioned approximately at the middle of stretcher above and below. Stones shall be laid in regular courses of not less than 30 cm in height. All courses shall be of the same height, unless otherwise specified. No stone shall be less in breadth than its height or less in length than twice its height, unless otherwise specified.

8-3.6.4 Joints

All joints shall be full of mortar. The thickness of any joint shall not be less than 3 mm. Face joints shall be uniform throughout and should have a uniform grove of 20 mm depth which is made with the help of a stone plate during the progress of work.

8-3.7 Pointing

Pointing shall be carried out in cement mortar not leaner than 1:3 (cement : sand) and shall conform to clause 7-9.3. The thickness of joints shall not exceed what is prescribed for each type of masonry.

8-3.8 Curing

Curing shall conform to clauses 7 -6 and 7-9.5.

8-3.9 Scaffolding

For scaffolding, clause 7 -7 shall apply.

8-3.10 Weep Holes

For weep holes in stone masonry, the Specifications given in clause 7 -10 shall apply except for the following:

i. The height of the weep holes shall be the same as the height of the course in which they are formed.
ii. The sides and bottom of the weep holes in the interior shall be made up with stones having fairly plain surface. The channel should then be formed by keeping stones having not less than 15 cm thickness as a slab over the side stones. These slab stones shall have a bearing of not less than 15 cm on each side.

8-3.11 Jointing with Existing Structures

For jointing with existing structures, the Specifications given under clause 7 -5 shall apply.

8-3.12 Architectural Coping for Wing/Return/Parapet Walls

Architectural coping for wing/return/parapet walls shall conform to clause 7 -11.

8 -4 Measurements For Payment

- Stone masonry shall be measured in cubic metres.
- In arches, the length of arch shall be measured as the mean length between the extrados and intrados.
- The work of pointing shall be measured in square metres of the surface treated.
- Architectural coping shall be measured in linear metres.

8 -5 Rates

The contract unit rate for stone masonry work shall include the cost of all labour, materials, scaffolding and other incidentals required to complete the work as per the Specifications. The rate shall also include full compensation for using specially dressed stones on the face of walls with batter and provision of weep holes.

The contract unit rate for pointing shall be paid in full for all necessary operations such as erecting and removal of scaffolding, raking out joints, cleaning, wetting, filling with mortar, trowelling, pointing, curing, etc. including full compensation for all labour, materials and other incidentals required to complete the work as per the Specifications.

The contract unit rate for architectural coping shall be paid in full for all necessary operations including full compensation for all labour, materials and other incidentals required to complete the work as per the Specifications.

Supply and Place stone Soling *DoLIDAR-Tech. Spec. for LBCWARR Clause 17*

17-1.4 **Laying GI Wire Crates (Gabion) and Mattresses in the Apron**

The crates shall be made from 5 mm galvanised iron wire. The mesh of the crate shall not be more than 150 mm.

Wire crates for shallow or accessible situations shall be 3 m x 1 m x 0.5 m in size. Where there is a chance of overturning, the crate shall be divided into 1.5 m compartments by cross netting.

For deep or inaccessible situations, wire crates can be made smaller subject to the approval of the Engineer.

Wire crates built in-situ shall not be larger than 3 m x 1 m x 1 m nor smaller than 2 m x 1 m x 0.3 m. Sides of large crates shall be securely stayed at intervals of not more than 1.5 m to prevent bulging.

The netting shall be made by fixing a row of spikes on a beam at a spacing equal to the mesh. The beam must be a little longer than the width of netting required. The wire is to be cut to lengths about three times the length of the net required. Each piece is bent at the middle and circled around one of the spikes. Then, the weaving shall commence from one corner.

A double twist shall be given at each intersection. This twisting shall be carefully done by means of a strong iron bar. In twisting, 5 half turns shall be given to the bar at each splice.

The bottom and two ends of the crate or mattress shall be made at one time. The other two sides shall be made separately and shall be secured to the bottom and to the ends by twisting adjacent wires together. The top of the crate shall be made separately. It shall be fixed in the same manner as the sides after the crate or mattress has been filled with stones.

Wherever possible, crates shall be placed in position before filling with boulders. The crates shall be filled carefully by hand-packing of the boulders as tightly as possible. Mere throwing of stones or boulders shall not be permitted

17 -5 MEASUREMENTS FOR PAYMENT

The protection works shall be measured as described below:

If directed by the Engineer, the materials may have to be stacked at site for measurement before laying. No extra payment shall be made to the Contractor for such stacking.

The boulders and wire crates (gabion) in apron shall be measured in cubic metres.

The filter and stone pitching shall be measured separately in cubic metres, unless otherwise specified.

Rubble stone flooring and cement concrete bedding shall be measured in cubic metres for each class of material.

Brick flooring shall be measured in square metres for one or two layers as specified.

Preparation of base for laying the flooring shall be deemed incidental to the work.

For laying apron, excavation up to an average depth of 15 cm shall be deemed to be included in the main item and shall not be measured separately, unless otherwise specified. Excavation for more than 15 cm depth shall be measured in cubic metres as given in clause **2 -4**.

17 -6 RATE

The contract unit rate for one cubic metre of finished work of apron shall include the cost of all labour, materials required to complete the work as per the Specifications. Excavation up to an average depth of 15 cm shall also be deemed to be included in this rate as dressing of the bed. Excavation beyond this depth shall be paid separately, unless otherwise specified.

The contract unit rate for one cubic metre of filter or stone pitching on slopes shall include the cost of preparing the base; placing materials to the profile; laying and compacting the filter; and stone pitching of dry rubble/brick revetment for embankment slopes to the specified thickness, lines, curves, slopes and levels including the cost of all labour, materials required to complete the work as per the Specifications.

The contract unit rate for rubble stone/brick flooring shall include the cost of all labour and materials required to complete the work as per the Specifications and drawings.

Provide and Place Geotextile*(DOR-SSRBW Section No.: 2404, 3110)*

2404. SUB-SURFACE DRAINS

(1) Scope

This Clause shall cover the works related to the construction of sub-surface drainage networks in slopes, slides and under road pavement. The drains shall be either main or tributary or of other types as shown on the Drawing.

Sub-surface drains shall consist of perforated HOP pipes surrounded by granular material laid in a trench. If specified in the contract, sub-surface drains shall also consist of perforated HOP pipes surrounded by geotextile/geomembrane and granular material laid in a trench.

(2) Materials

The materials used for construction of sub-surface drains shall comply with following requirements:

(a) Stone

Stones used for filling and lining of sub-surface drains shall comply with the specifications for dry stone pitching given in Sub-clause 2403 (4).

(b) Cement

Cement shall be Ordinary Portland Cement complying with the requirements of Section 2000.

(**c) Mortar**

The mortar used for cement masonry lining shall be as specified in Sub-clause 2403 (5).

(d) Gabion Works

Gabion works shall comply with the requirements specified in Clause 2401.

(e) Filter Material

Filter materials used in drains shall comply with the requirements specified in Clause 3110.

(f) Geomembrance

Geomembrane shall be made of PVC or polythene sheets of at least 0.8 mm thickness, duly protected from ultra-voilet exposure with 2.5 per cent carbon black, in black colour, supplied in roll form with a minimum of 3 m width. The joints of these sheets shall be heat bonded or seamed for effective permeation cut off. While fixing on to a slope, they shall not be punctured or stappled to impair their use.

(g) Geotextile

Geotextiles used for lining of drain trenches shall be as per the requirements of Section 600. The type of geotextile to be used for drains shall be approved by the Engineer prior to starting the works.

(h) Drain Pipe

Drain pipes shall be made of high density polyethylene and shall comply with series II as specified by NS 40/2040. Jointing of pipes shall be done by fine-cutting and heating following with equipment complying with the prescription of the HDP pipe manufacturer. Pipes may be jointed with angles to fit the requirements of the terrain, but angles shall not exceed the maximum specified by the manufacturer. The joints shall be watertight and develop the same strength as unjointed HDP material. The method of jointing shall be approved by the Engineer prior to starting the works. Drain pipes shall be provided with holes of minimum 5 mm diameter. The pipes shall be perforated by drilling minimum 50 holes per meter length on the upper half of the pipe in a staggered pattern uniformly distributed. The Engineer might adjust these specifications according to the site conditions.

(3) Construction

The detailed layout of the drainage network shall be as instructed by the Engineer, based on the general layout given in the Drawing.

The work shall start with construction at road side and then go up the slope by using already constructed drains as buttress for new drains.

The main drains shall be placed in naturally existing depressions. The tributary drains shall be at a maximum inclination of 45° to the main drain.

(a)Sub-Surface Drains without Geotextile/Geomembrane

Trench for sub-surface drain shall be excavated to the specified lines, grades and dimensions shown on the Drawing. Following considerations shall be made while excavating the drain and dumping excess materials.

(i) Depth of excavation shall be according to Drawing.

(ii) Top of structure shall be lower than natural ground.

(iii) No blasting shall be done in slides.

Wherever required or instructed by the Engineer, the Contractor shall provide trench struts and shoring as per approved design and shall execute in a manner to resist the earth pressure and in order to protect labour and work.

Where unsuitable material is encountered at the bed of trench, the same shall be removed to such depth as instructed by the Engineer and backfilled with approved material shall be compacted as specified in Clause 910.

Laying of pipe in the trench shall be started at the outlet end and proceed towards the upper end, true to the lines and grades specified. Before placing the pipe, filter material shall be laid for the full width of the trench bed and compacted. Unless otherwise shown on the Drawing, the thickness of this layer shall be 150 mm.

After the pipe installation has been completed and approved filter material shall be placed over the pipe to the required level in horizontal layers not exceeding 150 mm 2405 I and thoroughly compacted to 93% of the MOD (heavy compaction).

Pitching shall be done as per Clause 2403. The finished slope shall be reshaped to facilitate proper surface drainage towards drains

(b)Sub-surface Drains with Geotextile/Geomembrane

Excavation and backfilling shall be carried in the same manner as described above in (a). After excavating the trench for sub-surface drain, the filter fabric shall be placed and then the pipe shall be installed in the position as shown on the Drawing. Surfaces receiving filter fabric shall be free of loose or extraneous material and sharp objects. Adjacent rolls of the fabric shall be overlapped to a minimum width 450 mm. The preceding roll shall overlap the following roll in the direction the material is being spread.

After the installation of pipe, the trench shall be backfilled with the filter material in the same manner as described above in (a)

(4)Tests and Standard of Acceptance

Copies of the manufacturer's certificates for geotextile/geomembrane and drain pipe to be used while shall be furnished by the Contractor. In addition, the Engineer may ask for testing in independent laboratories. All test results shall meet the specified requirements.

Minimum one set of test for gradation analysis and compaction of filter material shall be checked for every 50 cu.m. and/or every change in source of material. The results shall meet specified requirements

(5) Measurement

Sub-surface drain with/without geotextile/geomembrane shall be measured in running meter which shall be inclusive of earth excavation, backfill/filter, and geotextile/geomembrane. Drain pipe shall be measured in running meters separately.

Pitching shall be measure as provided under respective clauses of these Specifications.

(6) Payment

Sub-surface drains with/without geotextiles/geomembranes, drain pipe and pitching shall be paid at the respective contract unit rates. The contract unit rates shall be the full and

the final compensation to the Contractor as per Clause 112 to complete the works as per these Specifications.

FILTER MATERIALS

‘ Materials

Filter materials shall be either gravel with geo-textile/geo-membrane or appropriately graded sand/gravel material as shown on the Drawing or directed by the Engineer.

Where geo-textile/geo-membrane is provided or shown on the Drawing, the filter material shall consist of gravel. It shall conform to the grading limits set out in Table 31.1.

Table 31.1: Filter Material Grading Limits

Sieve Size (mm)	Percentage Passing by Wright
63	100
37.5	85-100
20	0-20
10	0-5
0.075	-

Geotextile shall comply with Section 600. Geomembrane shall comply with Sub-clause 2404 (2).

Where no geotextile/geomembrane are provided or shown on the Drawing, the grading curve required for sand/filter material shall be determined for each site. Grading criteria requirement for both underlying and overlying material shall be fulfilled. The criteria shall be as follows:

a) $\frac{d_{15\%}\,filter}{} < 5$ b) $\frac{d_{50\%}\,filter}{} < 25$

b) $\frac{d_{15\%}\,filter}{} > 5$

Where, d15% designates the 15% size of the material (i.e. the size of the sieve that allows 15% by weight of the material to pass through it).

Similarly, d50% and d85% designate the sizes of sieve that allow 50% and 85% respectively by weight of the material to pass through it.

i. Construction

Surfaces receiving geo-textile/geo-membrane shall be free of loose or extraneous materials and sharp objects. Geo-textile/Geo-membrane shall be placed in accordance with the producer's instructions or as instructed by the Engineer. The minimum overlapping shall be 450 mm. If jointed in longitudinal direction by sewing or gluing, the joint shall have the same strength as the fabric itself.

The filter material shall be compacted layer by layer to a minimum density of 93% of the MDD (Heavy Compaction).

ii. Tests and Standard of Acceptance

Copies of manufacturer's certificate for geo-textile/geo-membrane to be used shall be furnished by the Contractor. In addition, the Engineer may ask for testing in independent laboratories. All test results shall meet the specified requirements.

Minimum one set of test for gradation and compaction of filter material shall be executed for every 50 cu.m. and every change in source of material. The results shall meet the specified requirements.

iii. Measurement

Geo-textile/Geo-membrane shall be measured in square meter. Overlapping shall not be measured for payment. Filter material shall be measured in cubic meter. No separate measurement of geo-textile/geo-membrane and filter material shall be done in case of sub- surface and drilled sub-surface drains.

iv. Payment

Geo-textile/Geo-membrane and filter material measured as provided above shall be paid the respective contract unit rates which shall be the full and the final payment to the Contractor as per Clause 112 to complete the work as per these Specifications.

Formwork and Surface Finish for Structures *(as per DoLIDAR-Tech. Spec. for LBCWARR Clause No. 9)*

9 -1 GENERAL

Formwork shall include all temporary or permanent forms required for forming the concrete together with all temporary construction required for their support.

9 -2 CONSTRUCTION OPERATION

Forms for concrete shall be constructed of metal or timber, suitably lined and be of substantial and rigid construction true to shape and dimensions shown on the drawings. Where metal forms are used, all bolts and rivets shall be of countersunk and well ground to provide a smooth and plane surface. Where timber is used, it shall be well seasoned and be free from loose knots, projecting nails, splits or other defects that may mar the

cement surface of concrete. For exposed concrete faces, timber for shuttering shall be wrought on all faces in contact with concrete.

Forms shall be mortar-tight and shall be made sufficiently rigid by the use of ties and bracings to prevent any displacement or sagging between supports. They shall be strong enough to withstand all pressures, ramming and vibration without any occurrence of deflection during and after the placement of concrete. Wherever required, screw jacks or hard wood wedges shall be provided to check any incumbent settlement in the formwork.

Suitable camber shall be provided in horizontal members of structure, specially in long spans to counteract the effects of any deflection. The formworks shall be fixed in a manner to ensure the formation of such camber.

Forms shall be so constructed as to be removable in sections in the desired sequence without damaging the surface of concrete or disturbing other sections of the formwork.

Unless otherwise specified or directed, chanfers or fillets having the size of 25 mm x 25 mm shall be provided at all angles of the formwork in order to avoid sharp corners.

9 -3 Formed Surfaces And Finish

The formwork shall be lined with a material approved by the Engineer in order to provide a smooth finish of uniform texture and appearance. This material shall leave no stain on the concrete. The lining material shall be joined and fixed to the formwork in such a manner that no blemishes will be left with the concrete. It shall be of the same type and obtained from only one source throughout the construction of any structure. The Contractor shall make good any imperfections in the resulting finish as required by the Engineer. Internal ties and embedded metal parts will be allowed only with the specific approval of the Engineer.

9 -4 Preparation Of Formwork Before Concreting

The inside surfaces of forms shall, except in the case of permanent formwork or where otherwise agreed by the Engineer, be coated with an approved material to prevent adhesion of concrete to the formwork. Release agents shall be applied strictly in accordance with the manufacturer's instructions and shall not be allowed to come in to contact with any reinforcement or pre-stressing tendon or anchorage. Different release agents shall not be used in formwork for concrete which will be visible in the finished work.

Special measures shall be taken to ensure that the formwork does not hinder the shrinkage of concrete, because without this, cracking could occur before the formwork is removed. Wherever applicable, arrangements must be made to ensure that the formwork does not restrain the shortening and hogging of the beams or slabs during tensioning of the tendons. The formwork should take due account of the calculated amount of positive or negative camber in order to ensure the correct final shape of the structures, having regard to the deformation of false work, scaffolding or propping and instantaneous or deferred deformation due to various causes affecting pre-stress structures.

Where there are re-entrant angles in the concrete sections, the formwork should be removed as soon as possible after the concrete has set in order to avoid cracking due to shrinkage of concrete.

Formwork shall be tight enough to prevent any appreciable loss of cement during vibrations. Suitable tolerances should be provided in the formwork. Immediately before concreting, all forms shall be thoroughly cleaned.

Contractor shall give due notice to the Engineer before placing any concrete in the forms to enable him to inspect and accept the false work and forms as to their strength, alignment and general fitness. But such inspections shall not relieve the Contractor of his/her responsibility for safety of men, machinery, materials and for results obtained.

9 -5 Removal Of Formwork

The Engineer shall be informed in advance by the Contractor of his/her intention to remove any formwork. While fixing the time for removal of formwork, due consideration shall be given to the local conditions, character of the structure, weather and other conditions that influence the setting of concrete and of the materials used in the mix.

The period shall be suitably increased in case of temperatures lower than 230C and for any other conditions tending to delay the setting of concrete.

Where field operations are controlled by strength tests of concrete, the removal of load-supporting or soffit forms may commence when concrete has attained strength equal to at least twice the stress to which the concrete will be subjected at the time of removing props including the effect of any further addition of loads. When field operations are not controlled by strength tests of concrete, the vertical forms of beams, columns and walls may be removed after 2 days. The props of beams may be removed after 21 days.

If rapid hardening cement is used, the periods specified above may be reduced to 3/7th.

All formworks shall be removed without causing any damage to the concrete. Centering shall be gradually and uniformly lowered in such a manner so as to avoid any shocks or vibrations. Supports shall be removed in such a manner that the concrete is allowed to take stresses due to its own weight uniformly and gradually.

Where internal metal ties are permitted, they or their removable parts shall be extracted without causing any damage to the concrete and the remaining holes shall be filled with mortar. All permanently embedded metal parts should have a cover of not less than 25 mm to the finished concrete surface.

Where it is intended to re-use the formwork, it shall be cleaned and made good to the satisfaction of the Engineer.

9 -6 Measurements For Payment

Where it is stipulated in the contract that the formwork shall be paid for separately, measurement for formwork shall be taken in square metres of the area of concrete surface which is in contact with formwork.

Where it is not specifically stated in the description of the item that formwork shall be paid separately, the rate of the reinforced cement concrete or pre-stressed cement concrete items shall be deemed to include the cost of all formwork.

9 -7 Rate

The contract unit rate for formwork where it is provided as separate item, shall include the cost of all labour, materials, precautionary measures and other incidentals required for the construction and removal of forms as described above and also for framing required to support the members until the concrete is sufficiently cured, set and **hardened.**

Steel Reinforcement for Structures (*as per DoLIDAR-Tech. Spec. for LBCWARR Clause No. 10_)*

10 -1 Description

This work shall include furnishing and placing of reinforcement according to the shape and dimensions given in the drawings and as specified in these Specifications.

10 -2 General

Steel shall be clean and free from loose rust and loose mill scale at the time of fixing in position and subsequent concreting.

10 -3 Bending Of Reinforcement

The reinforcement bars shall conform to the dimensions and shapes given in the Bar Bending Schedule shown on relevant drawings.

Bars must not be heated and shall be bent to the specified shape and dimensions or as directed by the Engineer using a skilled bar bender who does these works manually or by power-driven tools.

Bars shall not be bent or straightened in a manner that will damage the material. Bars which are bent during transportation or handling shall be straightened before being used on work. They shall not be heated to facilitate bending.

Unless otherwise specified, a U type hook at the end of each bar shall invariably be provided. The radius of the bend shall not be less than twice the diameter of the round bar. The length of the straight part of the bar beyond the end of the curve shall be at least four times the diameter of the round bar. In the case of deformed bars, the diameter shall be taken as the diameter of a circle having an equivalent effective area. The hooks shall be suitably encased to prevent any splitting of the concrete.

10 -4 Placing Of Reinforcement

All reinforcement bars shall be accurately placed in exact position shown on the drawings. They shall be securely held in position during the placing of concrete by binding them by annealed binding wire of not less than 1 mm in diameter and by supporting them by stay blocks, metal chairs, spacers, metal hangers, supporting wires or/and other approved devices which are placed at sufficiently close intervals. Bars will

neither be allowed to sag between supports nor displaced during concreting or any other operations. All devices used for positioning shall be of non-corrosive material. Wooden and metal supports will not be extended to the surface of concrete except where shown on the drawings. If placing of additional bars on the layers of freshly laid concrete is required as an attempt to adjust the bar spacing then such placing shall not be allowed at any instances. Layers of bars shall not be separated by stone pieces, bricks or wooden blocks, instead, these shall be separated by spacer bars, pre-cast mortar blocks or other approved devices.

Reinforcement after being placed in position shall be maintained in a clean condition until it is completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement at the time of concreting. A cover of concrete shall be provided as indicated on the drawings in order to protect reinforcement from corrosion. All bars which are protruding from concrete and are to be joined to the other bars shall be protected by a thick coat of neat cement grout if these are likely to be exposed to open air for sometime.

In case of columns and walls, vertical bars shall be kept in true vertical position by sliding them through the slots which are cut accurately on horizontally kept timber templates as per the exact bar positions. Such templates shall be removed after the concreting has progressed up to a level just below them.

Bars crossing each other shall be secured by binding wire (annealed) of not less than 1 mm in diameter in such a manner that they do not slip over each other at the time of fixing and concreting.

As far as possible, bars of full length shall be used. Where this is not possible, overlapping of bars shall be done as directed by the Engineer. When practicable, overlapping bars shall not touch each other but be kept apart by 25 mm or 1¼ times the maximum size of coarse aggregate, whichever is greater by allowing concrete between them. Where not feasible, overlapping bars shall be bound with annealed steel wire of not less than 1 mm in diameter and twisted tightly. The overlaps shall be staggered for different bars and located at points along the span where neither shear nor bending moment is maximum.

10 -5 Coupling Of Bars

Whenever indicated on the drawings or required by the Engineer, bars shall be joined by couplings having a cross-section which is sufficient for the transmission of requisite stresses transferred from the bars. The ends of the bars that are joined by coupling shall be upset for a sufficient length so that the cross-section at the base of threads is not less than the normal cross-section of the bar. The threads shall be standard Whiteworth threads. Steel for coupling shall conform to IS : 226 until similar Nepal's Standards are in place.

10 -6 Welding Of Bars

When permitted or specified on the drawings, joints of reinforcement bars shall be butt-welded in order to transmit the full strength exerted on the bars. Welded joints shall

preferably be located at points where steel will not be subjected to more than 75% of the maximum permissible stresses. The welds shall be so staggered that, at any one section, not more than 20% of the rods are welded.

Only electric arc welding using a process which excludes air from the molten metal and conforms to any or all other special provisions for the work will be accepted. Suitable means shall be provided for holding the bars securely in position during welding. It must be ensured that no voids are left in welding. When welding is done in several stages, previously welded surface shall be properly cleaned prior to each stage. Ends of the bars shall be cleaned of all loose scale, rust, grease, paint and other undesirable matter prior to welding. Only competent welders shall be employed for this work. The Mild Steel electrodes used for welding shall conform to IS : 814 until similar Nepal's Standards are in place. The welded pieces of reinforcement shall be tested. Specimens for the tests shall be taken from the actual site and their number and frequency of tests shall be as directed by the Engineer.

10 -7 Measurements For Payment

Reinforcement shall be measured in length, separately for different diameters, as actually used in the work excluding overlaps. From the measured length, the weight of reinforcement shall be calculated in tons on the basis of the type of steel. Lengths shall include hooks at ends but exclude the wastage, overlaps, couplings, welded joints, spacer bars and annealed steel wire for binding. Cost of these items shall be deemed to be included in the rates for reinforcement.

10 -8 Rate

The contract unit rate for reinforcement shall include the cost of all steel, its bending, placing, binding and fixing in position as shown on the drawings and as directed by the Engineer.

It shall also include the cost of

⇒ all devices for keeping reinforcement in approved position;
⇒ jointing as per approved method; and
⇒ all wastage, overlaps and spacer bars.

Plain and Reinforced Cement Concrete for Structures *(DoLIDAR-Tech. Spec. for LBCWARR Clause No. 11)*

11 -1 General

These Specifications cover all the requirements of cement concrete for use in various components of rural road structures.

For all the items of concrete in any structural portion of a cross drainage structure or its components, "controlled" concrete shall be used unless otherwise specified on the drawings or directed by the Engineer. For other concreting work that generally comes

across in rural road structures, "ordinary" concrete mix may be used provided that such works are clearly specified in the drawings.

11 -2 Grades of Concrete

11-2.1 Controlled Concrete

For controlled concrete, design of the mix shall be ascertained after the preliminary tests. During the production of controlled concrete, all necessary precautions shall be taken to ensure that the required cube strength is attained and maintained in the work. The controlled concrete shall be in eight grades designated as M 10, M 15, M 20, M 25, M 30, M 35, M 40 and M 45 with the suffix "Controlled" added to it.

11-2.2 Ordinary Concrete

In case of ordinary concrete, the mix is not required to be designed by preliminary tests. The proportions of cement, fine aggregates and coarse aggregates are specified by volume. The ordinary concrete shall be in four grades designated as M 10, M 15, M 20 and M 25. It can also be specified by volume as given in Table 11 -6(a).

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

11 -3 Strength Requirement Of Concrete

Where ordinary Portland cement conforming to IS : 269 or Portland blast furnace cement conforming to IS : 455 is used, the compressive strength requirements for various grades of concrete "controlled" as well as "ordinary" shall be as given in Table 11 -3. Where rapid hardening Portland cement is used, the 28 days' compressive strength requirements specified in Table 11 -3 shall be met at 7 days.

For "controlled" concrete, the mix shall be so designed to attain in preliminary tests a strength of at least 33% higher than that required on work tests. Preliminary tests need not be made in the case of "ordinary" concrete.

Table 11 -3 : Compressive Strength of Concrete in Work Tests

Grade of Concrete	Compressive Strength in N/mm2 on 150 mm cubes to be achieved in Work Tests after mixing is conducted in accordance with IS : 516	
	minimum at 7 days	minimum at 28 days
M 10	7.0	10.0
M 15	10.0	15.0
M 20	13.5	20.0
M 25	17.0	25.0
M 30	20.0	30.0

M 35	23.5	35.0
M 40	27.0	40.0
M 45	30.0	45.0

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

Where the strength of a concrete mix, as indicated by tests, lies in between the strength for any two grades specified in Table 11 -3, such concrete shall be classified for all purposes as a concrete belonging to the lower of the two grades.

11 -4 Admixtures

No materials other than the essential ingredients, i.e., cement, aggregates and water, shall generally be used in the production of concrete or mortar. But the Engineer may permit the use of approved admixtures for imparting special characteristics to the concrete on the basis of satisfactory evidence that its use does not in any way adversely affect the properties of concrete, particularly its strength, volume changes, durability and has no deleterious effect on the reinforcements.

11 -5 Size Of Coarse Aggregates

The maximum nominal size of coarse aggregates differs according to the type or item of work as given in Table 11 -5.

Table 11 -5: Maximum Nominal Size of Coarse Aggregates

Item of Construction	Maximum Nominal Size of Coarse Aggregate
(i) RCC well curb, RCC well steining and RCC piles	40 mm
(ii) PCC well steining	63 mm
(iii) Well cap or pile cap, solid type piers, abutments and wing walls and their pier caps	40 mm
(iv) RCC work in cross girders, deck slabs, wearing courses, kerbs, lamp posts, ballast walls, approach slabs, hollow type piers, abutments, wings walls and their pier caps	20 mm
(v) RCC bearings	20 mm
(vi) For any other item not covered by items (i) to (v).	As specified on the drawings or as directed by the Engineer in case it is not specified on drawing.

For heavily reinforced concrete members as in the case of ribs of main beams, maximum nominal size of aggregate shall usually be restricted to 5 mm less than the minimum lateral clearance between the main bars or 5 mm less than the minimum cover to the reinforcement, whichever is smaller.

11 -6 Proportioning Concrete

11-6.1 Controlled Concrete

Concrete mix for the controlled concrete shall be designed on the basis of preliminary tests. The proportions for ingredients chosen shall be such that concrete

⇒ has adequate workability for conditions prevailing on the work in question; and

⇒ can be properly compacted with the means available.

Except where it can be shown to the satisfaction of the Engineer that supply of properly graded aggregate of uniform quality can be maintained till the completion of work, grading of aggregate should be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions as required. Different sizes, however, shall be stocked in separate stock piles. Required quantity of materials shall be stock-piled several hours, preferably a day, before use. Grading of coarse and fine aggregates shall be checked as frequently as possible to ensure that the suppliers are maintaining the uniform grading as approved for samples used in the preliminary tests. The frequency of such checks for a given job shall be determined by the Engineer.

In proportioning concrete, the quantities of both cement and aggregate shall be determined by weight. Where the weight of cement is determined by accepting the manufacturer's weight per bag, a reasonable number of bags shall be weighed separately to check the net weight. Where cement is weighed from bulk stocks at site and not by bags, it shall be weighed separately from the aggregates. Water shall either be measured by volume in calibrated tanks or by weight. All measuring equipment shall be maintained in the clean and serviceable condition. Their accuracy shall be periodically checked.

It is most important to keep the specified water-cement ratio constant and at its correct value. For this, moisture content in both coarse and fine aggregates shall be checked as frequently as possible. The frequency of such checks for a given job shall be determined by the Engineer according to the prevailing weather condition. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For the determination of moisture content in the aggregates, IS : 2386 (Part III) shall be referred. Suitable adjustments shall also be made in the weight of aggregates to allow for its variations resulted due to the variations in moisture content.

The minimum quantity of cement to be used in controlled concrete shall not be less than 210 kg per cubic metre in plain concrete and not less than 300 kg per cubic metre in reinforced concrete. Similarly, the minimum quantity of cement for pre-stressed concrete shall not be less than 360 kg per cubic metre of concrete nor shall it be more than 540 kg per cubic metre of concrete.

11-6.2 Ordinary Concrete

The ordinary concrete mix shall generally be specified by volume. For cement which normally comes in bags and is used by weight, the volumes shall be worked out taking 50 kg of cement as 0.035 cubic metre in volume. Shaking, ramming or hammering shall not

be done when measuring aggregate by volume. Proportioning of sand shall be as per its dry volume and in case it is damp, allowance for bulking shall be made as per IS : 2386 (Part III).

Ingredients required for ordinary concrete containing one 50 kg bag of cement for different proportions of mix shall be as given in Table 11 -6(a).

Table 11 -6(a) : Ingredients Required for Different Grades of Ordinary Concrete

Grade of Concrete	Mix by Volume	Total quantity of dry aggregates by volume per 50 kg of cement to be taken as the sum of the individual volumes of fine and coarse aggregates (maximum)	Proportion of fine aggregate to coarse aggregate	Quantity of water per 50 kg of cement (maximum)
1	2	3	4	5
M 10	1:3:6	300 litres	Generally 1:2 for fine aggregate to coarse aggregate	34 litres
M 15	1:2:4	220 litres	by volume but subject to a	32 litres
M 20	1:1½:3	160 litres	upper limit of 1:1½ and a	30 litres
M 25	1:1:2	100 litres	lower limit of 1:3*	27 litres

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

Example : For an average grading of fine aggregate, the proportions shall be 1:1½, 1:2 and 1:3 for maximum size of aggregates 10 mm, 20 mm and 40 mm, respectively.

Note : A mix leaner than M 10 (1:3:6) may be used for non-structural parts of the bridge, if specified on the drawing or provided in the contract. In such case, grading of aggregates shall be as specified in the contract or on the drawing. Other requirements for mixing, placing and curing shall be the same as specified in this section.

11-6.3 Quantity of Water

The quantity of water shall be just sufficient to produce a dense concrete of required workability for the job. An accurate and strict control shall be kept on the quantity of mixing water.

In case of reinforced concrete work, workability shall be such that the concrete surrounds and properly grips all reinforcements. The degree of consistency which shall depend upon the nature of work and methods of vibration of concrete shall be determined by regular slump tests. The following slump values shall be adopted for different types of work.

Table 11 -6(b) : Slump Values for Different Types of Work

Type of Work	Slump Value	
	where vibrators are used	where vibrators are not used
Mass concrete in RCC foundations, footings and retaining walls	10 mm to 25 mm	80 mm
Beams, slabs and columns simply reinforced	25 mm to 40 mm	100 mm to 120 mm
Thin RCC section or section with congested steel	40 mm to 50 mm	125 mm to 150 mm

11 -7 Mixing Concrete

Where available on easy access, concrete for all works shall be mixed in a mechanical mixer. The mixer and its accessories shall be kept in good working condition and be maintained throughout the construction. Mixing shall be continued till

⇒ materials are uniformly distributed;

⇒ an uniform colour of the entire mass is obtained; and

⇒ each individual particle of the coarse aggregate shows complete coating of mortar containing its proportionate amount of cement.

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

When hand mixing is permitted by the Engineer for majority of the jobs in labour based rural roads, it shall be done on a smooth watertight platform large enough to allow efficient turning over of the ingredients of concrete before and after the addition of water. Mixing platform shall be so arranged that no foreign material shall get mixed with concrete nor does the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine aggregates which shall have been spread in a layer of uniform thickness on the mixing platform. Dry sand and cement shall then be mixed thoroughly by turning over to get a mixture of uniform colour. Enough water shall then be added gradually through a rose and the mass turned over till a mortar of required consistency is obtained. Measured quantity of coarse aggregate shall then be placed on the mixing platform. Then it shall be wetted and the mortar shall be added. Finally, the entire mass shall be turned and re-turned until all particles of the coarse aggregate are fully covered with mortar and the mixture obtained is of uniform colour and required consistency. In hand mixing, quantity of cement shall be increased by 10% above that specified in clause 11-6.2.

Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before loading a new batch. Unless otherwise agreed by the Engineer, the first batch of concrete from the mixer shall contain only two thirds of the normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of cement to another.

11 -8 Transporting, Placing And Compacting Of Concrete

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

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

No concrete shall be placed in any part of the structure without the approval of the Engineer. If concreting is not started within 24 hours of the approval, it shall have to be obtained again. Concreting shall then proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed.

Concrete when deposited shall have a temperature not less than 4.50C and not more than 380C. It shall be compacted in its final position within 30 minutes of its discharge from the mixer unless the concreting work is carried out with properly designed agitators, operating continuously. When using agitators, the delay time shall be maximum of 2 hours, counting from the addition of cement to the mix. However, the delay time shall be within 30 minutes of its discharge from the agitator.

Except where otherwise agreed by the Engineer, concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 m when internal vibrators are used and not exceeding 0.30 m in all other cases.

Unless otherwise agreed by the Engineer, concrete shall not be dropped into place from a height exceeding 2 m. When trunks or chutes are used, they shall be kept clean and used in such a way as to avoid segregation.

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

When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept clean, thoroughly wetted and covered with a 13 mm thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. The 13 mm thick layer of mortar shall be freshly mixed and placed immediately before placing of new concrete.

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

All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators or mild steel bars. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in case of breakdowns.

Internal vibrators shall be of not less than 10,000 rpm whereas external or form vibrators shall be of not less than 3,000 rpm. Vibrations shall not be applied through reinforcement. As far as possible, contact with reinforcement and all inserts shall be avoided where vibrators of the immersion type are used.

11 -9 Concreting Under Water

When it is necessary to deposit concrete under water, the methods, equipment, materials and proportions of the mix to be used shall have to be approved by the Engineer before the work starts. Such concrete shall not be considered as "Controlled Concrete".
Concrete shall not be placed in water having a temperature of below 4.50C. The temperature of the concrete, when deposited, shall not be less than 160C and not be more than 380C.

Concrete shall contain 10% more cement than that required for the same mix placed in the dry place. The material shall be so proportioned as to produce a concrete having a slump of not less 100 mm and not more than 180 mm. The slump shall be tested as per IS : 516.

Coffer dams or forms shall be sufficiently tight to ensure still water conditions, if practicable, and in any case to reduce the velocity of water to less than 3 m per minute through the space into which concrete is to be deposited. Coffer dams or forms in still water shall be sufficiently tight to prevent loss of mortar through the joints in the walls. Pumping shall not be done during concreting and 24 hours thereafter.

Concrete shall be deposited continuously until it has been brought to the required height. While depositing, the top surface shall always be kept as evenly level as possible and formation of seams shall be avoided. For depositing concrete in structural components of

rural road structures, the "Drop Bottom Bucket Method" which is the simplest method of depositing concrete underwater should be adopted.

Drop Bottom Bucket Method: The top of the bucket shall be closed. The bottom doors shall move freely downward and outward when tripped. The bucket shall be filled completely and lowered slowly to avoid backwash. It shall not be dumped until it rests on the surface upon which the concrete is to be deposited. When concrete is discharged, the bucket shall be withdrawn slowly until it reaches well above the concrete.

The other method called "Tremie" which is considered to be more sophisticated for labour-based rural road construction is not discussed in these Specifications.

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

11 -10 Curing of Concrete

11-10.1 Protection and Water Curing

Immediately after compaction, concrete shall be protected against harmful effects of weather, running water, shocks, vibrations, traffic, rapid temperature changes, frost and drying out process. It shall be covered with wet sacking, hessian or other similar absorbent material approved by the Engineer soon after the initial set and shall be kept continuously wet for a period of not less than 14 days from the date of placement. Masonry work over the foundation concrete may be started after 48 hours of its laying but curing of concrete shall be continued for a minimum period of 14 days.

11-10.2 Steam Curing

For concreting in rural road structures, this particular method of curing is not recommended.

11 -11 Working In Extreme Weather Conditions

Where concrete is to be deposited at or near freezing temperatures, necessary precaution shall be taken to ensure that the temperature of the concrete shall not be less than 4.50C. Not only that, this temperature should be maintained until it is thoroughly hardened. If necessary, the ingredients shall be heated before mixing and the concrete shall be carefully protected after placing. In general, heating of water alone to about 600C may be sufficient for this purpose. Salt or other chemicals should not be used as a prevention from freezing. Calcium chloride up to 1½% by weight of cement can be used to accelerate the rate of hardening. Use of calcium chloride in excess of this percentage is considered to be harmful. No frozen material or materials containing ice shall be used. All concrete damaged by frost shall be removed. It is recommended that concrete exposed to freezing weather shall have entrained air and the water content of the mix shall not exceed 30 litres per 50 kg of cement.

When depositing concrete in very hot weather, precautions shall be taken so that the temperature of wet concrete does not exceed 380C while placing. This shall be achieved by

⇒ stacking aggregate under the shade and keeping them moist;
⇒ using cold water;
⇒ reducing the time between mixing and placing to the minimum;
⇒ cooling formwork by sprinkling water;
⇒ starting curing before the concrete dries out; and
⇒ organising concreting as far as possible during mornings and evenings.

11 -12 Finishing

Immediately after the removal of forms, all exposed bars or bolts which either pass through the reinforced cement concrete member or use for the shuttering or any other purpose shall be cut inside the RCC member to a depth of at least 25 mm below the surface of the concrete. The resulting holes shall be closed by cement mortar. All fins caused by form joints, cavities produced by the removal of form ties, all other holes and depressions, honey-comb spots, broken edges or corners and other defects shall be thoroughly cleaned; saturated with water; and carefully pointed and rendered true with mortar of cement and fine aggregates mixed in the proportions used in the grade of concrete that is being finished. Considerable pressure shall be applied in filling and pointing to ensure proper filling in all voids. Surfaces which have been pointed shall be kept moist for a period of 24 hours.

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

If, in the opinion of the Engineer, the rock pockets/honey-combs are existing in the concrete to an extent which may affect the strength of the structure materially as well as endanger the life of the steel reinforcement then, he may declare the concrete defective and instruct for the removal and replacement of the portions of the structure affected.

11 -13 Construction Joints

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

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

Before resuming work at any construction joint, all laitance shall be removed thoroughly if the concrete has not yet fully hardened. While removing the laitance, care should be taken to avoid any dislodgement of coarse aggregates. In case where the concrete has fully hardened, the surface shall be thoroughly hacked, swept clean, wetted and covered with a layer of neat cement grout. The neat cement grout shall be followed by a 13 mm thick layer of mortar mixed in the same proportion as in concrete. The first batch of concrete shall be rammed against the old work to avoid formation of any stone pockets. Particular attention shall be paid to corners and close spots.

In pre-stressed concrete structures, construction joints shall be avoided as far as possible specially in the area of tensile stresses. Where necessary, concreting shall be carried out continuously up to such joints which shall preferably be transverse to the line of main compression. In all cases, the position and detailed arrangement of all construction joints shall be predetermined. For such works, the approval shall be taken in advance from the Engineer.

11 -14 Tests and Standards of Acceptance

11-14.1 Preliminary Tests for Controlled Concrete

For controlled concrete, the preliminary tests (refer to clause 11-2.1) shall be conducted as three sets of separate tests. In each set, tests shall be conducted on six specimens. On any particular day, not more than one set of six specimens shall be made. Out of the six specimens in each set, three shall be tested at seven days and the remaining three at 28 days. The preliminary tests at 7 days are intended only to indicate the strength likely to be attained at 28 days.

11-14.2 Work Strength Tests for Controlled and Ordinary Concrete

Work strength tests shall be made in accordance with IS : 516. Each test shall be conducted on ten specimens, five of which shall be tested at 7 days and the remaining five at 28 days. The samples of concrete shall be taken on each day of concreting and cubes shall be made at the rate of one set (10 specimens) for every 5 cubic metres of concrete or a part thereof. However, if concreting done in a day is less than 15 cubic metres, the number of cubes could be reduced to a minimum of 6 with the special permission of the Engineer. If so, three shall be tested at 7 days and the remaining three at 28 days.

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

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

All necessary labour, materials, equipment (other than testing), etc., for sampling, preparing test cubes, curing, etc., shall be arranged by the Contractor. However, if any additional support is required, it shall be provided by the Engineer. Testing of the materials and concrete shall be arranged by the Engineer in an approved laboratory at the cost of the Contractor.

11-14.3 Standards of Acceptance

The average strength of the group of cubes cast in each day shall not be less than the specified compressive cube strength of works. However, 20% of the cubes cast in each day may have values less than the specified strength, provided that the lowest value is not below 85% of the specified strength.

11 -15 Use Of Plums in Ordinary Concrete

Stone plums shall not be used unless specified on the drawings. When used, the size of stone plums may be from 150 to 300 mm. The maximum dimension of these stones or plums shall not exceed 1/3rd of the least dimension of the members.

All plums shall be hard, durable, clean and free from soft materials or loose pieces or deleterious substance and shall not have sharp corners.

During concreting, the first layer of concrete of the specified mix shall be laid to a thickness of at least 2.5 times the thickness of the maximum size of plums to be used. The plums shall then be laid while the top portion of this concrete is still within the initial setting time. But, the concrete should then be sufficiently stiff enough to prevent complete submergence of the plums. These plums shall remain half embedded in the concrete and the other half exposed so as to form a key with the next layer of concrete. No plums shall be used for concrete which is laid under water.

While placing the plums, care shall be taken to ensure that the clear distance between any two plums is not less than either the width or thickness of either of the plums. The distance from plums to the outer surface or to any steel reinforcement shall be equal to the greatest width of the plum.

If plums of stratified stone are used, they shall be laid on their natural bed. Stones with concave faces shall be laid with the concave face upwards. The thickness of the next and successive layers of concrete shall be at least twice that of the largest plums. The total volume of plums shall not exceed 15% of the volume of the finished concrete.

11 -16 Measurements for Payment

The cement concrete shall be measured in cubic metres. In reinforced concrete, the volume occupied by reinforcement shall not be deducted. The slab shall be measured as running continuously through and the beam as the portion below the slab.

11 -17 Rate

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

Pipe Culvert– *as per technical specification for LBCWARR clause no 15*

15-1 General

This work shall consist of furnishing and installing reinforced cement concrete pipes having the type, diameter and length required at locations shown on the drawings or as directed by the Engineer. All such works shall be in accordance with the requirements of these Specifications.

15 -2 Materials

All materials used in the construction of pipe culverts shall conform to the requirements of Section 6. Each consignment of cement concrete pipes shall be inspected, tested (if necessary) and approved by the Engineer either at the place of manufacture or at the site before their use in the works.

15 -3 Excavation for Pipe

The foundation bed for pipe culverts shall be excavated true to the lines and grades shown on the drawings or as directed by the Engineer. The pipes shall be placed in shallow excavation of the natural ground or in open trenches cut in existing embankments according to the levels shown on the drawings. In case of high embankments where the height of the fill is more than three times the external diameter of the pipe, the embankment shall first be built to a height which is equal to the external diameter of the pipe and to a width which is not less than five times the external diameter in each side of the pipe. Then, a trench shall be excavated and the pipe shall be laid.

Where trenching is involved, its width on either side of the pipe shall not be
⇒ less than 150 mm
⇒ nor more than one-third the diameter of the pipe.
The sides of the trench shall be as vertical as they could be.

During excavation, if the material encountered is soft, spongy or other unstable soil and unless other special construction methods are employed under special provisions, such unsuitable material shall be removed to such depth, width and length as directed by the Engineer. The excavation shall then be backfilled with approved granular material which shall be properly shaped and thoroughly compacted up to the specified level.

Where bed-rock or boulder strata are encountered, excavation shall be continued at least 200 mm below the bottom level of the pipe with prior permission of the Engineer. All rock and boulders in this area shall be removed and the space in between shall be filled with approved earth which is free from stone and fragmented materials. Then, the fill shall be shaped to the requirements and be thoroughly compacted to provide adequate support for the pipe.

Trenches shall be kept free from water until the pipes are installed and subsequently, the joints have hardened.

15 -4 Bedding For Pipe

The bedding surface shall provide a firm foundation of uniform density throughout the length of the culvert.
The bedding surface shall conform to the specified levels and grade and shall be of one of the following two types as specified on the drawings.

15-4.1 First Class Bedding

Under first class bedding, the pipe shall be evenly bedded on a continuous layer of well compacted approved granular material which is shaped concentrically to fit the lower part of the pipe exterior for at least 10% of its overall height or otherwise shown on the drawings. The bedding material shall be well graded sand or another granular material passing 4.75 mm sieve. The thickness of the bedding layer shall be as shown on the drawings and in no case shall it be less than 75 mm.

15-4.2 Concrete Cradle Bedding

When indicated on the drawings or directed by the Engineer, the pipe shall be bedded in a cradle which is constructed of concrete having a mix not leaner than M 15 and conforming to Section 11. The shape and dimensions of the cradle shall be as indicated on the drawings. The pipes shall be laid on concrete bedding before the setting of concrete.

15 -5 Laying Of Pipe

No pipe shall be placed in position until the foundations have been approved by the Engineer. Where two or more pipes are to be laid adjacent to each other, they shall be separated by a distance equal to at least half the diameter of the pipe subject to a minimum of 450 mm.
The laying of pipes on the prepared foundation shall start from the outlet and proceed towards the inlet and be completed to the specified lines and grades. The pipes shall be fitted and matched so that when laid in work, they form a culvert with a smooth and uniform invert.

Any pipe found defective or damaged during laying shall be removed at the cost of the Contractor/Users' Group.

15 -6 Jointing

The pipes shall be jointed either by collar joint or by flush joint.

15-6.1 Collar Joint

In a collar joint, the collars shall be of RCC having 150 to 200 mm width and the same strength as of the pipes to be jointed. Caulking space shall be between 13 and 20 mm according to the diameter of the pipes. Caulking material shall be slightly wet mix of cement and sand in the ratio of 1:2 rammed with caulking irons. Before caulking, the collar shall be so placed that its centre coincides with the joint and an even annular space is left between the collar and the pipe.

15-6.2 Flush Joint

Flush joint may be internal flush joint or external flush joint. In either case, the ends of the pipes shall be specially shaped to form a self centering joint with a jointing space of 13 mm wide. The jointing space shall be filled with mortar of cement and sand having a ratio of 1:2 which is mixed sufficiently dry to remain in position when forced with a trowel or rammer. Care shall be taken to fill all voids as well as to remove excess mortar.

15-6.3 Jointing Pipes under Light Hydraulic Pressures

When jointing pipe lines which are under light hydraulic pressures, the recess at the end of the pipe shall be filled with jute braiding dipped in hot bitumen or other suitable approved compound. Pipes shall be so jointed that the bitumen ring of one pipe shall set into the recess of the next pipe. The ring shall be thoroughly compressed by jacking or by any other suitable means.

15-6.4 Joints (General)

All joints shall be made with care so that their interior surface is smooth and consistent with the interior surface of the pipes. After finishing, the joint shall be kept covered and damp for at least four days.

15 -7 Backfilling

Trenches shall be backfilled immediately after the pipes have been laid and the jointing material has been hardened. The backfill soil shall be clean and free from

⇒ boulders,
⇒ large roots,
⇒ excessive amounts of sods or other organic matter, and
⇒ lumps

and shall be approved by the Engineer.

Backfilling up to 0.3 m above the top of the pipe shall be carefully done. The soil shall be thoroughly rammed, tamped or vibrated in layers of not more than 150 mm thickness. Particular care shall be given in instances where the materials are to be compacted under the haunches of the pipes.

Filling of the trench shall be carried out simultaneously on both sides of the pipe in such a manner that unequal pressures do not occur on the pipe surface.

In case of high embankments, after filling the trench up to the top of the pipe in the above said manner, a loose fill of a depth equal to external diameter of the pipe shall be placed over the pipe before further layers are added and compacted.

15 -8 Head Walls and Other Ancillary Works

Headwalls, wing walls, aprons and other ancillary works shall be constructed in accordance with the details shown on the drawings or as directed by the Engineer. Masonry for the walls shall conform to the requirements given in Sections 7,8 and 11 as applicable.

The work on aprons shall conform to the requirements given in Section 17 of the Specifications.

15 -9 Opening To Traffic

No traffic shall be permitted to cross the pipe line unless the earth filling above the pipe is at least 0.6 m.

15 -10 Measurements For Payment

RCC pipe culverts shall be measured along their centre line between the inlet and outlet ends in linear metres.

Selected granular material and cement concrete for pipe bedding shall be measured as laid in cubic metres. Ancillary works like headwalls, etc. shall be measured as described in the respective Sections of the Specifications.

15 -11 Rate

The contract unit rate for the pipe shall include the cost of pipe including loading, unloading, hauling, handling, storing, laying in position and jointing of the pipe completely. Ancillary works such as excavation including backfilling, concrete and masonry shall be paid for separately as provided under the respective clauses.

PAVEMENT WORKS

Preparation and Surface Treatment of Formation *(as per DOR Section 1003)*

Preparation and surface treatment of formation shall be carried out only after completion off all drainage works unless otherwise agreed by the Engineer and prior to laying the subbase or the base where no subbase is required. The sequence of operations shall be as follows:

(i) Formation of Loose Untreated Materials

Materials for use in the subgrade shall not contain particles larger then 60 mm. In addition the material shall have a CBR of not less than 5% measured after a 4-day soak on a laboratory mix compacted to 95% MDD (heavy compaction), a swell of less than 1% a plasticity index of less than 40% and an organic matter content less than 3%. In-situ material in the subgrade in cutting that does not meet these requirements shall either be spoiled or, if suitable, placed in the embankment. The spoiled material shall be replaced with material meeting the requirements for loose material in the subgrade.

In fill areas, and in cutting except otherwise instructed by the Engineer, according to the material encountered, loose materials of the embankment and cuttings shall be deposited in the layers of 150 mm compacted depth. Each layer shall extend reasonably more than the full width of the embankments or cutting and shall be compacted in accordance with requirements as specified hereunder:-

(a) The material shall be broken down to the above specified grading and any oversize material which cannot be broken down to the require size shall be removed and disposed off. The material shall be scarified and the moisture content shall be adjusted by either uniformly mixing in water or drying out the material such that the moisture content during compaction is between 95% and 100% of the Optimum Moisture Content. The moisture content shall be kept within these limits until compaction is complete except where otherwise instructed by the Engineer.

(b) Each layer shall be compacted to a dry density equal to at least 95% MDD (heavy compaction).

(c) In accordance with Section 500, the Contractor shall submit to the Engineer his proposals for the compaction of the material to be used in the subgrade. The proposal shall be based on the type of plant, the range of passes and the loose depth of the layer.

The Contractor shall carry out site compaction trials, supplemented by necessary laboratory investigations, and shall satisfy the Engineer that all the specified requirements regarding compaction shall be achieved. Site compaction trials shall be completed and approved by the Engineer before the permanent Works commences.

(d) Testing to be carried out during the construction of subgrade shall include the following:

The MDD (heavy compaction) and OMC shall be determined for each new material encountered and in every 3000m2 or part of each layer of compacted subgrade. The field dry density shall be determined at least once per 250m2 or part of it of each layer of compacted subgrade. The test of field density shall be conducted in staggered manner i.e. at left, at crown and at right in the carriageway.

The soaked CBR of material in the subgrade shall be determined at least in every 3000m2 or part of it of each layer.

The Contractor shall request in writing for the Engineer's approval for each layer in accordance with Sub-clause 509 (1) and such request shall be accompanied by the tests results of the above described testing and all additional relevant information required. If the results are as specified, he will approve for addition of another layer or will ask for further tests or rework to meet the requirements.

(ii) Formation of Loose Treated Materials

The sequence of operation shall be as described in Clauses 1005 to 1006 of this Specification.

(iii) Formation in Rock Cutting

The subgrade in rock cutting shall be regulated after trimming the rock excavation by a regulating course of minimum 150 mm compacted depth of natural complying with the requirements of natural material for subbase as specified in Sub-clause 1201 (3).

The regulating course shall be laid, compacted and tested in accordance with Clause 1201 and the surface regularity shall meet the requirements of Clause 1101.

(iv) Preparation of Formation for Rehabilitation Works

After reinforcement of any soft areas, all surface below carriageways, lay-bys, cycle tracks, footways and hard shoulders shall be well cleaned and freed from mud an slurry

(v) Proofrolling

All subgrade shall be proofrolled with a loaded scraper or truck with a minimum axle load of 8 tonnes. Proofrolling shall be satisfactorily completed before the layer is submitted to the Engineer for approval and shall be carried out in the presence of the Engineer. All proofrolling shall be at the Contractor's expense.

(6) Surface Regularity and Tolerances

The surface regularity and tolerance of the subgrade shall meet the requirements of Clause 1101.
When each layer is completed the Contractor shall comply with the requirements of Clause510 for requesting the Engineer's approval and protecting

MECHANICALLY STABLE SUBBASE *(DoR-SSRBW SECTION No. 1201)*

(1) Scope

This Clause covers the construction of subbase with naturally occurring mechanically stable quartzitic gravel, river gravels and transported gravels, or materials resulting from the weathering of rocks, or clayey/silty sand.

(2) Sources of Materials

Subbase materials shall be obtained from approved sources in borrow or cut or from such other sources of supply as may be specified or approved from time to time for use.
The Contractor shall comply with all requirements of Section 800 in respect of borrow pits.

(3) Material Requirements

The subbase material after placing and compaction shall conform to the following requirements:

a. Gravel

The grading of the material after placing and compaction shall be a smooth curve within and approximately parallel to the envelope given in Table 12.1.

The Plasticity Index shall not exceed 6.

Table 12.1: Grading Envelope for Gravel

Sieve Size (mm)	Percentage passing by weight
63.0	100
40.0	70-100
20.0	50-85
10.0	40-75
4.75	30-60
2.36	20-45
1.18	15-35
0.075	4-15

b. Sands, Silty and Clayey Sands

- % passing 2 mm sieve : max 95%
- % passing 0.075 mm sieve : min 10 – max 30%
- Plasticity Index : min 5 – max 12%
- Plasticity Modules : max 300%

(PI_ % passing 0.425 mm sieve)

c. All Materials

The CBR of the material, after 4 days soaking, shall not be less than 30% at 95% MDD (Heavy Compaction).

(4) Compaction Trials

Before commencing construction and from time to time as may be considered necessary by the Engineer, the Contractor shall carry out compaction trials in the presence of Engineer on each main types of materials to be compacted in the Works. He shall carry out all necessary laboratory and field testing and supply the Engineer with the copies of the results of all tests.

Following completion of the compaction trials, the Contractor shall submit to the Engineer, for his approval, proposals for the compaction of each main type of material. The Contractor's Proposals shall include reference to the type of equipment, the operating weights and tyre pressures and the method of adjusting moisture content.

If, in the opinion of the Engineer, the results of the compaction trials indicate that the Contractor's proposed plant and methods shall achieve the densities specified, the Engineer shall approve the same. Otherwise the Contractor shall submit in writing proposals for modifying the plant and/or methods and shall compact further trials in accordance with these modified proposals until the Engineer approves the Contractor's proposals.

(5) Laying and Compacting

The material shall be deposited in such quantity and spread in a uniform layer across the full width required, so that the final compacted thickness is nowhere less than shown on the Drawing or instructed by the Engineer. Every reasonable effort shall be made to prevent segregation during mixing, dumping, spreading, trimming and compacting operations.

The compacted thickness of any layer laid, processed and compacted at one time shall not exceed 150 mm and when a greater compacted thickness is required, the material shall be laid and processed in two or more layers. The minimum layer thickness shall be 100 mm.

The material shall be down to the grading specified in Sub-clause 1201 (3). Any oversize material which con not be broken down to the required size shall be removed and disposed off.

The material shall be scarified and the moisture content adjusted by either uniformly mixing with water or drying out the material such that the moisture content during compaction is between 95% and 100% of the Optimum Moisture Content (IS 2720 Part 8). It shall be graded and trimmed to final line and level. Light compaction may be applied before the final trim is carried out, but once 25% of the compactive effort has been applied no further trimming or correction of surface irregularities shall be allowed.

All rolling shall be longitudinal and shall commence at the outer edges of the pavement and progress towards the centre, except that on super elevated curves, rolling shall progress from the lower to the higher edge. Where laying is carried out in lanes care must be taken to prevent water entrapment.

The final trim shall be in cut and the Contractor shall ensure that material from the trim is neither deposited in low areas nor spread across the section but graded clear of the works. Following the final trim the material shall be compacted to a dry density of at least 95% of MDD (IS 2720 Part 8). During the grading, trimming andcompaction of the material the Contractor shall ensure that the surface and/or the material does not dry out. If so, the Contractor need to apply fog sprays of water orother approved means sufficient to maintain the surface and/or material within the specified limits of moisture content.

On completion of compaction, the surface shall be well-closed, free from movement under compaction plant and free from compaction planes, ridges, cracks, loose or segregated material. If the surface fails to meet the specified requirements, the Contractor shall take the action set out in the appropriate part of Section 1100 or such other action as directed by Engineer.

(6) Proof rolling

Unless otherwise directed by the Engineer, the Contractor shall proof roll the completed layer with a steel three-wheeled roller applying a load of not less than 5 tonnes per metre width of roll and the layer shall be free from visible movement under the proof roller. Approval of the layer shall only be given after the satisfactory completion of the proof rolling and any remedial measures shall be at the Contractor's expense.

(7) Setting out and Tolerances

The layer shall be set out and constructed to the appropriate tolerance specified in Section 1100.

(8) Drainage of Subgrade and Subbase

The subgrade and sub base shall be kept continuously drained and any damage caused by water accumulating on or running off the surface shall be made good at the Contractor's expense.

Water accumulated on any part of the subgrade or sub base, shall be removed and disposed off. Any material, which becomes saturated, or cannot then be compacted to the required density, shall be replaced as specified at Contractor's own expense.

(9) Testing

(a) Process Control

The minimum testing frequency for the purpose of process control shall be as given in Table 12.2

Table 12.2: Minimum Testing Frequency

Tests	One test in every	Min. no of tests per section
Materials:		
Gradation	200m^3 or part of it and change in source	2
Plasticity Index		2
Maximum Dry Density and Optimum Moisture Content	200m^3 or part of it and change in source	2
Field Density and Moisture Content	200m^3 or part of it and change in source	2
Construction Tolerance:		
Surface Levels	500 m^2	-
Thickness		-
Width	10 m	-
	25 m	
	200 m	

(b) Routine Inspection and Testing

Routine inspection and testing shall be carried out by the Engineer to test the quality of materials and workmanship for compliance with the requirements of this section.

Any materials or workmanship that do not comply with the specified requirements shall be replaced with materials and/or workmanship complying with the specified requirements or be replaced to comply with the specified requirements.

(10) Measurement

Mechanically stable sub base shall be measured in cubic metre by taking cross Section at intervals of 10 metres or as directed by the Engineer in the original position before the work starts and after its completion and computing the volumes in cubic metres by average end area method.

(11) Payment

The sub base construction shall be at their respective contract unit rate. In addition to stated in Clause 112, the contract unit rate shall be also full and the final

compensation for cost of making arrangement for traffic control and other costs required to complete the work complying with the requirement of Sections 500, 800 and Clause 1201.

GRADED CRUSHED STONE BASE AND SUBBASE *(DoR- SECTION No. 1202)*

(1) Scope and Definition

This clause covers procuring, furnishing and placing of approved crushed stone on top of the complete subgrade or subbase and constructing a crushed stone subbase or base, as the case may be, in accordance with the requirement of this Specification.

"Graded crushed stone" shall mean crushed stone with a smooth grading curve within a specified envelope.

The class of the stone of the graded crushed stone to be provided shall be specified in the Special Specification or in the Bill of Quantities.

(2) Sources of Materials

The Contractor shall be responsible for locating and developing suitable of material for graded crushed stone. Such sources shall be termed quarries. The opening up of quarries, and the construction and maintenance of access roads shall be carried out in accordance with Section 800.

(3) Material Requirements

The material shall comply with following requirements:

(a) It shall consist of crushed stone, free from clay, organic or other deleterious matter.

(b) It shall comply with the physical requirements defined in Table 12.3.

Table 12.3: Physical Requirements of Graded Crushed Stone

Tests	**Base**		**Subbase**
	B*	C1*	D1*
LAA Max. %	30	35	40
AIV Max. %	20	25	30
SSS Max. %	12	12	12
FI %	25	25	30
CBR Min. %	80	80	60
CR Min. %	100	80	30
PI Max.	NP	NP	6

*** B, C1 and D1 are classes of materials**

(c) It shall comply with the Following Gradings

After processing, placing and compaction in the pavement the grading of the material shall be smooth curve within and approximately parallel to one of the envelopes defined in Table 12.4.

Table 12.4 Grading Envelopes for Graded Crushed Stone

Sieve Size (mm)	**Percentage passing by weight**		
	Base	**Subbase**	
		SB1*	**SB2***
63.0	-	100	100
40.0	100	75-100	85-100
31.5	85-100	42-75	75-95
20.0	62-92	25-60	60-87
10.0	40-70	15-45	50-80
4.75	26-55	12-37	12-32
2.36	21-53	6-25	7-21
0.60	12-28	5-21	6-17
0.075	2-10	3-12	3-10

*** SB1 and SB2 are classes of subbase**

(4) Crushing, Screening and Mixing

Unless otherwise instructed, crushing shall be carried out at least in two stages.

The crushing, screening and proportioning of materials and their subsequent mixing shall be carried out using methods and machines acceptable to the Engineer. To avoid segregation, graded crushed stone shall be moistened when being handled and shall not be stockpiled in heaps higher than 5 m.

If the Contractor wishes to add material from another source in order to achieve the specified grading the following conditions shall apply:

(a) The Contractor shall be responsible for all costs associated with the provision and mixing in of the material, including land acquisition.

(b) The material shall be non-plastic, hard and durable as specified. Particles shall be free from organic materials, clay and other deleterious substances.

(c) Only material passing the 6.3 mm sieve may be added, the percentage to be added shall be agreed with the Engineer and in any case shall not exceed 15% by weight of the mixture.

(d) The minimum crushing rations as well as other physical requirements as specified in Sun-clause 1202 (3) shall be maintained.

(5) Transporting Graded Crushed Stone

Graded crushed stone shall be transported and dumped in such a way that no segregation occurs.

(6) Compaction Trials

The Contractor shall carry out compaction trials in accordance with Sub-clause 1201 (4).

(7) Laying and Compacting

The Contractor shall take appropriate measures to prevent segregation during dumping and spreading operations.

The graded crushed stone shall be laid by plant capable of distributing the graded crushed stone in a layer of uniform thickness and without segregation.

The compacted thickness of any layer laid, processed and compacted at one time shall not exceed 150 mm, and where a greater thickness is required, the graded crushed stone shall be laid in two or more equal layers.

The compacted thickness of any base layer shall not be less than 3 times the maximum size of the graded crushed stone and the compacted thickness of any subbase layer shall not be less than 2 times the maximum size of the graded crushed stone.

As soon as possible after laying, compaction shall be carried out. The moisture content shall be adjusted as necessary and, during compaction, care shall be taken to maintain the moisture content evenly at the specified value. Unless otherwise instructed by the Engineer, the moisture content at the time of compaction shall be between 95 and 100% of the Optimum Moisture Content determined as per IS 2720 Part 8. The appropriate Sections of Sub-clause 1201 (5) shall also be applicable for this Clause 1202.

All rolling shall be longitudinal and shall commence at the outer edges of the pavement and progress towards the centre, except that on superelevated curves, rolling shall progress from the lower to the higher edge. Where laying is carried out in lanes care must be taken to prevent water entrapment.

The minimum dry densities to be achieved as a percentage of the Maximum Dry Density (MDD) determined in accordance with IS 2720 Part 8 shall be:

Base	:	98% of MDD
Sub base	:	95% of MDD

On completion of the compaction the surface shall be well closed, mechanically stable, free from visible movement under compaction plant and free from compaction planes, ridges, and cracks, loose or segregated material. If the surface

fails to meet the requirements of these Specifications, the Contractor shall take the action set out in the appropriate part of Section 1100 or such other action as directed by the Engineer.

(8) Proofrolling

The Contractor shall proof roll completed layers in accordance with Sub-clause 1201 (6).

(9) Setting out and Tolerances

Graded crushed stone sub base and base shall be set out and constructed to the tolerances given in Section 1100.

(10) Testing

(a) Process Control

The minimum testing frequency for process control shall be as specified in Table 12.5.

Table 12.5: Minimum Test Frequency

Tests	One test in every	Min. no of tests per section
Materials:		
Gradation	200m^3 or part of it and change in source	2
Plasticity Index		2
Flakiness Index	200m^3 or part of it and change in source	2
Maximum Dry Density and Optimum Moisture Content	200m^3 or part of it and change in source	2
Los Angeles Abrasion		-
Aggregate Impact Value	100m^3 or part of it and change in source	-
Sodium Sulphate Soundness	200m^3 or part of it and change in source	-
Crushing Raito	200m^3 or part of it and change in source	2
CBR		
Field Density and Moisture Content	500m^3 or part of it and change in source	-
	200m^3 or part of it and change in source	-
Construction		-
Tolerance:	500m^3 or part of it and change in source	-
Surface Levels		
Thickness		

Width smoothness	500 m^2 10 m 25 m 200 m 40 m^2	

(b) Routine Inspection and Testing

Routine inspection and testing shall be carried out by the Engineer to test the quality of materials and workmanship for compliance with the requirements of this section.

Any materials or workmanship that do not comply with the specified requirements shall be replaced by materials and/or workmanship complying with the specified requirements, or be repaired so that after being repaired it shall comply with the specified requirements.

(11) Measurement

Graded crushed stone base and sub base shall be measured in cubic metre by taking cross Sections at intervals of 10 metres or as directed by the Engineer in the original position before the work starts and after its completion and computing the volumes in cubic metres by average end area method.

(12) Payment

The graded crushed stone construction shall be paid at their respective contract unit rate. In addition to stated in Clause 112, the contract unit rate shall be also the full and the final compensation for cost of making arrangement for traffic control and other costs required to complete the work complying with the requirement of Section 500, 800 and Clause 1201.

SECTION 1300 – BITUMINOUS SURFACE AND BASE COURSE
1301 GENERAL REQUIREMENTS FOR BITUMINOUS PAVEMENT LAYERS

(1) Scope

This Clause comprises general requirements for bituminous pavement courses. The use of machinery and equipment mentioned in various Clauses of these Specifications is mandatory.

(2) Bituminous Binder

All bituminous binders shall comply with the relevant requirements set out in Section 600. The choice of binder shall be stipulated in the Contract or by the Engineer. Where viscosity grades of bitumen are specified, IS: 73. Where modified bitumen is specified, it shall conform to the requirements of IRC: SP: 53 and IS: 15462; and the following provision of this Specification shall apply.

i) Modified bitumen from refinery sources or blended at approved central plant or at site using appropriate industrial process and plant with high shear mill, and testing facilities to achieve stable and homogenous mix shall be used. The use of high shear mixer or any other device capable of producing a homogeneous blend is essential when the modifier is in powder form.
ii) Transportation tanks and storage tanks shall be insulated and equipped with effective heating system and circulation/ agitating device to maintain the specified temperature, homogeneity and viscosity of the bitumen during transit and storage.
iii) Separation, difference in softening point (R&B), shall not be more than 3°C for any type of specified modified bitumen when tested as per Annex B of IS: 15462.

Selection criteria for viscosity grade bitumen, based on highest and lowest daily mean temperatures at a particular site, Table 13-1.
Selection criteria for modified bitumen shall be in accordance with IRC- Sp. 53, / Table 13-2

Table 13-1: Selection Criteria for Viscosity-Graded (VG) Paving Bitumen Based on Climatic Conditions

Lowest Daily Mean Air Temperature, °C	Highest Daily Mean Air Temperature, °C		
	Less than 20°C	20°C 20 to 30°C	More than 30°C
More than -10°C	10°C VG	10 VG	20 VG
-10°C or lower	10°C VG	10 VG	20 VG

Table 13-2 Selection criteria for Modified bitumen. Based on Climatic Conditions

S. No	Highest Mean Air Temperature	<20° C	20° C – 35° C	Above 35° C	Method of Test IS No (6)
	Lowest Mean Air Temp			>-10°C	
	Characteristics	Specified value for Bitumen			
(1)	(2)	(3)	(4)	(5)	
i	Penetration at 25° C 0.1 mm, 100g, 5S	60 to 120	50 to 80	30 to 50	1203
ii	Softening point, (R& B) °C Min	50	55	60*	1205
iii	FRAASS** Braking Point, °C Max	-20	-16	-12	9381
iv	Flash point COC °C Min	220	220	220	1209
v	Elastic Recovery of half thread in ductilometer at 15° C , percent Min	50	60	60	IRC – SP 53 annexure- 2
vi	Complex modulus ($G^*/\sin\delta$) as minimum 1.0 Kpa at 10 rad/S at a temperature ° C	58	70	76	IRC – SP 53 annexure- 1
vii	Separation , difference in softening point (R & B) °C Max	3	3	3	IRC – SP 53 annexure- 3
viii	Viscosity at 150 ° C Poise	1-3	3-6	5-9	1206 (part 2)
ix	Thin film oven test on residue				
a	Loss in mass, percent ,Max	1	1	1	9382
b	Increase in softening point	7	6	5	1205
c	Reduction in penetration of residue ,at 25°C, percent, Max	35	25	35	1203
d	Elastic recovery of half thread in ductilometer at 25° C or	35	50	50	IRC – SP 53 annexure- 4
	Complex modulus ($G^*/\sin\delta$) as minimum 2.2 Kpa at 10 rad/S at a temperature ° C	58	70	76	IRC – SP 53 annexure- 1

Where Max Temperature exceeds 40oC , Softening point should be at 65oC

** Fraass breaking point requirement will be applicable for area of sub zero Temperatures.

Choice/ selection criteria of cold mix treatment for different Climate/ Traffic conditions shall be in accordance with IRC- Sp. 100 / Table 13-3.

Table 13-3: Choice/ selection criteria of cold mix treatment for different Climate/ Traffic conditions

Type of Treatment	Traffic (CVPD)	Climate		Choice of Emulsion
		Temperature	Rainfall	
Prime Coat	No Limit	No Limit	No Limit	SS-1
Tack coat	No Limit	No Limit	No Limit	RS-1
Seal Coat	<1500	No Limit	No Limit	SS-2
Sand Seal	<1500	No Limit	No Limit	SS-2
Cap Seal	<3000	No Limit	No Limit	RS-2/ SS-2, / Modified
Chip Seal	<1500	Avoid in Cold Climate	No Limit	Rs-2/ Modified
Slurry Seal	<1500	No Limit	No Limit	SS-2
Micro surfacing	No Limit	No Limit	No Limit	Modified
Open Graded Premix Carpet (OGPC)	<1500	Moderate & cold climate (maximum air temperature 40° C)	Medium	MS/ SS-2, / Tailor made
Mix Seal Surfacing (MSS)	<1500	Moderate & cold climate (less than 40° C)	Low	MS/ SS-2, / Tailor made
Bituminous Mix (BM)	<1500	Moderate & cold climate (maximum air temperature 40° C)	Low	MS/ SS-2, / Tailor made
Semi Dense Bituminous Concrete (SDBC)	<3000	Moderate & cold climate (maximum air temperature 40° C)	Low	SS-2, / Tailor made
Half Warm Mix (DBM, SDBC, BC)	<4500	Moderate & cold climate (maximum air temperature 40° C)	No Limit	SS-2, / Tailor made
Cold Recycling	No Limit	Moderate & cold climate	No Limit	SS-2, / Tailor made
Patching	No Limit	No Limit	No Limit	MS/ SS-2 / Tailor made

Recommended uses for different types of Emulsion on Climatic Conditions are as follows:

Type	Recommended Use
RS 1	A quick setting Emulsion used for Tack coat
RS 2	A quick setting Emulsion used for surface treatment , Surface dressing Penetration Macadam

MS	A medium setting emulsion used for plant or road mixes with coarse aggregate for premix carpet
SS - 1	A slow setting emulsion used for priming
SS - 2	A slow setting emulsion used for plant mixes with graded fine aggregates in SDBC, MSS, BM, DBM and BC. This emulsion is used for slurry seal treatment and tack coat
Modified	Modified Emulsion is used for micro surfacing

(3) Storage and Handling of Bituminous Binder

When carried in bulk containers, of binder temperature during and at the time of storage shall be kept in a manner acceptable to the Engineer. During storage the temperature of the bituminous binder shall be kept as low as possible, consistent with reasonable pump ability. Any bituminous binder not conforming to the requirements of Sub-clause 1301 (4) shall be rejected by the Engineer as unsuitable for use.

When bitumen emulsion is stored on site in large container, then the conditions of storing shall comply with the manufacturer's instructions and/or as per IS: 3117/8887.

Where bitumen emulsions are stored on site in drums, the drums shall be regularly "rolled" to ensure mixing of the contents. Prior to using, all bituminous emulsion drums shall be "rolled" just before opening and use. Emulsions shall be protected against frost and temperatures below 3° C.

The bitumen storage area and heating station shall be cleared of vegetation, kept neat and tidy. The drums shall be stacked on their sides in small quantities with gaps between each stack to reduce fire risk.

Bitumen distributors and boilers shall be kept clean at all times. When changing the grade of bitumen and at the end of each day's work, all boilers and distributors shall be thoroughly cleaned out with a solvent. The flushing's from boilers and distributors shall not be poured anywhere indiscriminately, but shall be led by drainage channels to disposal pits. Care shall be taken that flushing's do not find their way into storm water ditches or streams. All boilers, pre-heating pits, tools and plant shall be kept scrupulously clean.

When filling the bitumen distributor from the boilers or bulk containers, the bitumen shall be passed through a filter of fine wire mesh having opening of not more than 0.6mm.

On completion of the works, the disposal pit and drainage channels shall be filled in and top soiled. The site shall be left clean and tidy.

(4) Heating of Bituminous Binder

The bituminous binder shall be heated in boilers or bulk storage containers, equipped with adequate pumps and accurate thermometers. No bitumen shall be heated in a boiler when the thermometer is broken, inaccurate or not equipped with it.

Pre-mixed bituminous materials shall be prepared in a hot mix plant of adequate capacity and capable of yielding a mix of proper and uniform quality with thoroughly coated aggregates. Appropriate mixing temperatures are given in Table 13.4 of these Specifications. The difference in temperature between the binder and aggregate shall at no time exceed 14°C. In order to ensure uniform quality of the mix and better coating of aggregates, the hot mix plant shall be calibrated from time to time. The essential features of the hot mix plants are given in Annex A. of IRC: 27

The minimum pumping temperatures, the range of spraying temperatures and the maximum heating temperatures of cut-backs, Viscosity grade bitumen's and emulsions are given in Table 13.4 below.

Table 13.4: Temperatures Ranges for Heating and Spraying Binders

Binder	*Minimum Pumping*	Temperatures (°C) Spraying *		Maximum Heating
		Slot-jets	Atomizing jets	
Cut-back RC 800	60	110-115	-	120
Cut-back RC 3000	80	125-135	-	135
Cut-back MC 30	10	35-45	50-60	65
Cut-back MC 70	25	55-65	70-85	85
Cut-back MC 800	60	100-115	120-135	135
Cut-back MC 3000	80	125-135	135-150	150
Paving Bitumen	105	155-165	160-170	170
Emulsion ** Cationic	-	-	-	95
Emulsion ** Anionic	-	-	-	95

* *These spraying temperatures are for guidance only, since the optimum spraying temperature depends on the temperature/viscosity relationship of the bitumen*.

* *The minimum pumping and spraying temperatures for Cationic / Anionic Emulsion shall be in accordance with the manufacturer's recommendations.*

Recommended Mixing, Laying and Rolling Temperatures for Bituminous Mixes(Degree Celsius) is specified in Table 13.5 . In case of modified bitumen, the temperature of mixing and compaction shall be higher than the mix with conventional binder. The exact temperature depends upon the type and amount of modifier used and shall be adopted as per the recommendation of the manufacturer.

Table 13.5: Mixing Laying and Rolling Temperature for Bituminous mix

Bitumen Viscosity Grade	**Bitumen Temp-erature**	**Aggregate Temperature**	**Mixed Material Temperature**	**Laying Temperature**	*** Rolling Temperature**
VG-40	160-170	160-175	160-170	150 min	100 min
VG-30	150-165	150-170	150-165	140 min	90 min
VG-20	145-165	145-170	145-165	135 min	85 min
VG -10	140-160	140-165	140-160	130 min	80 min

For slot-jets the viscosity for spraying shall be 70 to 100 centistokes and for atomizing jets 35 to 60 centistokes.

No pavement bitumen, cut-back bitumen, or emulsion shall be heated above the maximum temperature given in the Table.13.4 Any overheated bitumen or emulsion shall be removed from the site and disposed off by the Contractor.

The rates of application of binder specified or instructed by the Engineer refer to volumes of binder shall be corrected to 15.6^{o}C using Standard Petroleum Measurement as specified in Annex 1300-1

(5) Weather Limitations

In case of following situation
Laying shall be suspended:

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

Bituminous material, except for bitumen emulsions and certain types of prime coat if instructed by the Engineer, shall not be applied on a damp surface.

(6) Cutting Back of Bitumen

The maximum amounts of paraffin as given in Table 13.6 may be added with the permission of the Engineer to the basic grade of bitumen upon the road surface temperature at the time of spraying. Lesser amounts than those indicated may be used, if the site conditions allow the development of sufficient adhesion between binder, aggregate and existing surface. Diesel or kerosene shall be used for cutting back of bitumen as per the direction of the Engineer.

Table 13.6: Maximum Addition of Paraffin

Range of Road Surface Temperature ^{o}C	Maximum Addition of Paraffin by Volume %	Range (approximate) of Corresponding Ambient Air Temperature ^{o} C
22-29	7	10-16
22-36	5	16-21
39-43	3	21-26
43-50	1	26-31
above 50	NIL	above 31

The temperature of bitumen, when paraffin is introduced, shall not be higher than 120^{o}C. The paraffin shall be sucked from 200 litre drums in measured quantities through the bitumen pump and circulated with the bitumen for a minimum of 45 minutes. During this process all burners shall be shut off and no open flames allowed near the distributor.
Cutback bitumen may be produced by the addition of volatile diluents (cutter) in accordance with Transport Research Road Laboratory TRRL Research Report RR 140 "Preparation of Cutback Bitumen"

Adhesion Agent /Anti-Stripping Agent

Where the proposed aggregate fails to pass the stripping test then an approved anti stripping agent may be added to the binder in accordance with the manufacturer's instructions. The effectiveness of the proposed anti-stripping agent must be demonstrated by the Contractor, before approval by the Engineer. The Engineer may prescribe some additional periodic test such as " under water coating test" stripping value for passive

adhesive, Thermal stability, or solubility in high speed diesel" to confirm that the adhesive agent being used is as claimed by the manufacture.

Table 13.7 Specification for Anti-stripping Agent

Description	Test method	Requirements
Appearance	Visual	Dark Brown Liquid
Specific Gravity at 27^0C	IS 1448	0.85 ±0.1
Pour point	IS 1448	Max 42
Flash point	IS 1448	>150^0C
Moisture content	IS 1448	Max 1.0 %
Solubility in Diesel Oil in the Ratio 2:98 at 50^0 C	IS 6241	Min 95%
Stripping Value with Bitumen Containing 1 % Agent 40^0 C for 24 Hours	IS 6241	No Stripping
Under water coating test	IS 6241	Min 95%
Thermal stability at 163^0C	IS 6241	Stable

Where required the adhesion agent shall be of an approved type and shall be used in accordance with the manufacturer's instructions and as instructed by the Engineer.

(7) Requirement of Bituminous Mix

(a) Asphalt Plant

Bituminous materials shall be mixed in a plant complying with IS: 3066 and shall be located on nearby location of the site unless otherwise agreed by the Engineer. It shall be equipped with at least three bins for the storage of heated aggregates and a separate bin for filler. All bins shall be covered to prevent the ingress of moisture.

The plant may be either batch-mix type or the continuous-mix type and shall be capable or regulating the composition of the mixture.

The bitumen tank shall be capable of maintaining its contents at the specified temperature within a tolerance of plus or minus 5^o C and shall be equipped with a thermostat to prevent the temperature rising above 180^oC and a fixed thermometer easily read from outside the tank. Any bitumen which has been heated above 180^oC or has suffered carbonization from prolonged heating shall be removed from the plant and disposed off.

(b) Mix design

The bitumen content required shall be determined following the Marshal mix design procedures contained in Asphalt institute manual MS-2.

At least two months prior to commencing work using a bituminous mix, the Contractor shall be having demonstrated that he can produce aggregates meeting the grading requirements of the Specification, submit samples of each constituent of the mix to the Engineer.

The maximum size of the aggregate for wearing course shall equal to or less than the thickness of wearing course divided by 2.5 and that for binder course shall equal to or less than thickness or binder course divided by 2.

The Contractor shall then carry out laboratory tests in order to propose the proportions of each consistent of the initial mix or mixes to be used for site trials to be carried out in accordance with these specifications.
The Engineer shall conclude form the site trials that the mix proportions or aggregate grading are to be changed, the Contractor shall submit further samples of the constituents, carry out further laboratory and site trials as directed by the Engineer.

(c) Mixing of Aggregate and Bitumen

The bitumen shall be heated so that it can be distributed uniformly. Care shall be taken not to overheat it. The temperature shall never exceed 170o C for paving bitumen.
The aggregate shall be dried and heated so that they are mixed at the following temperatures unless otherwise specified in respective Clause.

Proposed Bitumen	**Temperature in oC**
VG-10	125-160
VG-20 or VG-30	130-170

The dried aggregates shall be combined in the mixer in the amount of each fraction of the agreed mix and the bitumen shall then be introduced into the mixer in the amount specified. The materials shall then be mixed until a complete and uniform coating of the aggregate is obtained.
The mixing time shall be the shortest required to obtain a uniform mix and thorough coating. The wet mixing time shall be determined by the Contractor and agreed by the Engineer for each plant and for each type of aggregate used. It shall normally not exceed 60 seconds.

(d) Transportation of the Mixture

The bituminous mix shall be kept free of contamination and segregation during transportation. Each load shall be covered with canvas or similar covering to protect it from dust and adverse effect of the weather.

(e) Laying of the Mixture

Immediately after the surface has been prepared and approved, the mixture shall be spread to line and level by the laying plant without segregation and dragging.
The mixture shall be place in widths of one traffic lane at a time, unless otherwise agreed by the Engineer. The compacted thickness of nay layer shall be at least 2.5 times the maximum size of the aggregate for wearing course and at least 2 times the maximum size of the aggregate for binder course.
Only on area where irregularities or unavoidable obstacles make the use of mechanical laying impracticable, the mixture may be spread and compacted by hand.

(f) Compaction

Immediately after the bituminous mixture has been spread, it shall be thoroughly and uniformly compacted by rolling.

The layer shall be rolled when the mixture is in such a condition that rolling does not cause undue displacement or shoving.

The number, weight and type of rollers furnished shall be sufficient to obtain required compaction while the mixture is in a workable condition. The sequence of rolling operations shall be as agreed with the Engineer.

Initial rolling with a steel tandem of three-wheeled roller shall follow the laying plant as closely as possible. The rollers shall be operated with the drive roll nearest the laying plant, at a slow and uniform speed (not exceeding 5 km/h).

Rolling shall normally commence from the outer edge and proceed longitudinally parallel to the centreline, each trip overlapping one half of the roller width. On super elevated curves, rolling shall begin at the low side and progress to the high side. Where laying is carried out in lanes care must be taken to prevent water entrapment.

Intermediate rolling with a pneumatic tyre or vibratory roller shall follow immediately. Final rolling with a steel wheeled roller shall be used to eliminate marks from previous rolling.

To prevent adhesion of the mixture to the rollers, the wheels shall be kept lightly moistened with water.

In areas too small for the roller, a vibrating rate plate compactor or a hand tamper shall be used to achieve the specified compaction.

(g) Finishing, Joint and Edges

Any mixture that becomes loose and broken, mixed with dirt or foreign matter or is in any way defective, shall be replaced with fresh hot mixture, which shall be compacted to conform to the surrounding area.

Spreading of the mixture shall be as continuous as possible. Transverse joints shall be formed by cutting neatly in a straight line across the previous run to expose the full depth of the course. The vertical face so formed shall be painted lightly with hot VG10 or similar grade bitumen just before the additional mixture is placed against it.

Longitudinal joints shall be rolled directly behind the paving operation. The first lane shall be placed true to line and level an approximately vertical face. The mixture placed in the abutting lane shall than be tightly crowded against the face of the previously placed lane. The paver shall be positioned to spread material overlapping the joint face by 20 – 30 mm. Before rolling, the excess mixture shall be raked off and discarded.

When the abutting lane is not placed in the same day, or the joint is destroyed by traffic, the edge of the lane shall be cut back as necessary, trimmed to line and painted lightly with hot VG 10 or similar grade bitumen just before the abutting lane is placed.

Any fresh mixture spread accidentally on the existing work at a joint shall be carefully removed by brooming it back on to un-compacted work, so as to avoid formation of irregularities at the joint. The finish at joints shall comply with the surface requirements and shall present the same uniformity of finish, texture and density as other sections of the work.

The edges of the course shall be rolled concurrently with or immediately after the longitudinal joint. In rolling the edges, roller wheels shall extend 50 to 100 mm beyond the edge.

(h) Sampling and testing of Bituminous mixtures

The test and their minimum frequencies for the different types of bituminous work shall be as given in Table 5.2. The Engineer may direct additional testing as required to fulfil the requirement as specified in corresponding Clause.

The acceptance criteria for tests on density shall subject to the condition that the mean value is not less than the specified value plus:

$$1.65 - \frac{1.65}{\sqrt{No\ of\ samples}} = times standard\ deviation$$

Where the Contract specifies the surface roughness requirements, in terms of Bump integrator value, the surface roughness value shall be measured by a calibrated Bump integrator as per the procedure described in IRC: SP: 16. The measurements shall be taken at centre line of each lane for a minimum completed length of one Km.

During mixing and laying of bituminous mixtures, control tests on the constituents and on the mixed material shall be carried out in accordance with Section 600 and relevant Clauses of Section 1300.

If the results of any tests show that any of the constituent materials fail to comply with this Specification, the Contractor shall carry out whatever changes may be necessary to the materials and/or to the source of supply to ensure compliance.

If the results of more than one test in ten on the mixed material show that the material fails to comply with this Specification, laying shall forthwith cease until the reason for the failure has been found and corrected. The Contractor shall replace any faulty material laid with material complying with this Specification all at his expense.

(i) Tolerance

Surfacing and base shall be constructed within the geometric tolerance specified inSection 1100.

The Contractor shall maintain the composition of the mixture as determined from the laboratory and site trials with the following tolerances, per single test:-

(a) Bitumen : ± 0.3% of total weight of bitumen in total mix.

(b) Aggregates

(i)	Passing through 10 mm sieve and larger sieves	±6% of	Total weight of aggregate including mineral filler
(ii)	Passing through 10 mm sieve and retained on 1mm sieve	±4% of	
(iii)	Passing through 1 mm sieve and retained on 0.075 mm sieve	±3% of	
(iv)	Passing through 0.075 mm sieve	±2% of	

The average amount of bitumen in any length of any layer, calculated as the productof the bitumen contents obtained from single tests and the weight of the mixturerepresented by each tests, shall not vary beyond the limit of tolerance of the amountspecified.

The average amount of bitumen for each day's production calculated form the check weights of mix shall not vary beyond the limits of tolerance of the amount specified.
The final average overall width of the upper surface of a bituminous mix layer measured at six equidistant points over a length of 100 m shall be at least equal to the width specified. At no point shall the distance between the centre line of the road and the edge of the upper surface of a bituminous mix layer be narrower than that specified by more than 13 mm.

(8) Safety Precautions

The Contractor shall take every precaution to avoid fire or health hazards. He shall always ensure that:
(a) bitumen is heated only to the temperature required for the particular application;
(b) hot bitumen never comes in contact with water;
(c) suitable protective clothing, foot wears and gloves are used when handling bitumen; and
(d) Dust is reduced to the minimum.
Care is required when using rapid-curing cut-back, because of the highly flammable nature of the solvent.

(9) Trial Sections

Before commencing execution and from time to time as may be considered necessary by the Engineer the Contractor shall carry out trial sections at location instructed by the Engineer to demonstrate to the Engineer that this his surfacing operation is capable of executing the works in accordance with the Specification.
The Contractor shall allow in his program for conducting site trials and for carrying out the appropriate tests on them. The trial on any pavement layer shall be undertaken at least 21 days ahead of the Contractor proposing to commence the full scale work on that layer
In case of Bituminous mix Full scale laying and compacting site trials shall be carried out by the Contractor on all asphalt pavement materials proposed for the works using the construction plant and methods proposed by the Contractor for construction the works. The trials shall be carried out at a location approved by the Engineer in his presence.
The trials shall be carried out to enable the Contractor to demonstrate the suitability of his mixing and compaction equipment to provide and compact the materials to the specified voids content and confirm that the other specified requirements of he completed asphalt pavement layer can be achieved.
Each trials area shall be at least 100 metres long to the full construction width and depth for the material. It may form part of the Works provided it complies with this Specification. Any areas which do not comply with this Specification shall be removed.
The Contractor shall compact each section of trial over the range of compact effort the Contractor is proposing. The following data shall be recorded for each level of compact effort at each site trial.

(i) The composition and grading of the material including the bitumen content and type and grade of bitumen used.
(ii) The moisture content of aggregate in the asphalt plant hot bins.
(iii) The temperature of bitumen and aggregate immediately prior to entering the mixer, the temperatures of the mix on discharge from the mixer and the temperature of the mix on commencement of laying, on commencement of compaction and on completion of compaction.

(iv) The type, size, mass, width of roll, number of wheels, wheel load, tyre pressures, frequency of vibration and the number of passes of the compaction equipment, as appropriate for the type of roller.

(v) The target voids and other target properties of the mix together with the results of the laboratory tests on the mix.

(vi) The density and voids achieved.

(vii) The compacted thickness of the layer.

(viii) Any other relevant information as directed by the Engineer.

At least eight sets of tests shall be made by the Contractor on each 100 metres of trial for each level of compact effort and provided all eight sets of results over the range of compact effort proposed by the Contractor meet the specified requirements for the material then the site trial shall be deemed successful. The above data recorded in the trial shall become the agreed basis on which the particular material shall be provided and processed to achieve the specified requirements.

During the execution of the works, if the Construction control/process control tests indicate that the requirements for a material are not consistently achieved then work on that layer shall be stopped until the cause is investigated by the Contractor. Such investigation may include further laboratory and/or site trials on the material to determine a revised set of data as described above which when agreed, shall be the basis on which all subsequent material shall be provided and processed to achieve the specified requirements.

Agreement of the Engineer to a set of data recorded in a site trial shall not relieve the Contractor of any responsibility to comply with the requirements of this Specification. In the course of such trials the Engineer may call upon the Contractor to modify his method of working, to employ other items of equipment and to amend the rates of spread at which various materials are applied.

When the Engineer is satisfied that the Contractor is capable of constructing surfacing that complies with the Specification after trial section or section, the Contractor shall receive permission to commence the work. No variation in the approved procedures shall be made without the Engineer's prior consent in writing.

(10) Measurement and Payment

Unless stated otherwise, no separate measurement and payment shall be made for complying with the requirements of Clause 1301. The Contractor shall include related costs of complying with the requirements of Clause of Section 1300.

1302 PRIME COAT AND TACK COAT

(1) Scope and Definitions

This Clause covers the application of a bitumen prime and tack coat to be applied on a prepared pavement layer.

A prime coat means a thin layer of low viscosity bituminous binder applied to an absorbent non-bituminous surface. If the prime coat is to be trafficked, it shall be covered with binding material.

A tack coat means a thin layer of bituminous binder applied to a bituminous surface.

(2) Materials

The primer shall be cationic bitumen emulsion SS1 grade conforming to IS: 8887 or medium curing cutback bitumen conforming to IS: 217 or as specified in the Contract. The primer shall comply with Section 600 from a source approved by the Engineer. The grade and the rate of application of cutback to be used shall be instructed by the Engineer on site after field trials. Spray rate may be used as given in Table 13.8 and Table 13.9 as a guidelines.

Table 13.8: Quantity of SS1 grade Bitumen Emulsion for Various Types of Granular Surfaces

Type of Surface	Rate of Spray (kg/sq.m)
Low porosity(WMM/WBM)	0.7-1.0
Medium porosity (Mechanically stabilized soil base, lime/ cement stabilized soil and lime cement base)	0.9-1.2
High porosity (Stabilized soil bases/Crusher Run Macadam)	1.2- 1.5

Table 13.9: Type and Quantity of Cutback Bitumen for Various Types of Granular Surface

Type of Surface	Type of Cutback	Rate of Spray (kg/sq.m)
WMM/WBM	MC 30	0.6-0.9
Stabilized soil bases/ Crusher Run Macadam	MC 70	0.9-1.2

For Tack coat, the binder shall be an either Cationic bitumen emulsion (RS 1) complying with IS: 8887 or suitable low viscosity paving bitumen of VG 10 grade conforming to IS: 73. The use of cutback bitumen RC: 70 as per IS: 217 shall be restricted only for sites at sub-zero temperatures or for emergency applications as directed by the Engineer.

No dilution or heating at site of RS 1 bitumen emulsion shall be permitted. Paving bitumen if used for tack coat shall be heated to appropriate temperature in bitumen boilers to achieve viscosity less than 2 poise. The normal range of spraying temperature for a bituminous emulsion shall be 20°C to 70°C and for cutback, 50°C to 80°C. The method of application of tack coat will depend on the type of equipment to be used, size of nozzles, pressure at the spray bar, and speed or forward movement. The Contractor shall demonstrate at a spraying trial, that the equipment and method to be used is capable of producing a uniform spray, within the tolerances specified. Spray rate of Tack coat given in Table 13.10 may be used as guidelines.

Table 13.10: Rate of Application of Tack Coat

Type of Surface	Rate of Spray (kg/sq.m)
Bituminous surfaces	0.40-0.60
Granular surfaces treated with primer	0.50- 0.60
Cement concrete pavement	0.60-0.70

The binding layer, if any shall be crushed rock or river sand having grading within the limits of the table below. The aggregate shall be clean, hard and free from excessive dust. It shall contain no clay, loam or other deleterious materials. Grading for sand for Prime coat shall satisfy the requirement specified in Table 13.11

Table 13.11: Grading Envelope for Sand for Prime Coat

Sieve size (mm)	Percentage Passing (by mass)
4.75	100
2.36	80-100
1.18	60-95
0.6	30-80
0.3	20-55
0.075	10-30

(3) Preparation of Surface.

The surface to be sprayed shall be thoroughly cleaned by sweeping with mechanical brooms and/or washing or other approved means. All laitance of soil or binder material, loose and foreign material shall be removed.

All loose material shall be swept clear of the layer to expose the full width of the layer upon which prime/tack coat shall be applied. The surface to be sprayed shall be checked for line, camber and level, and the surface corrected, made good as necessary and approved by the Engineer before any bituminous spray is applied. The Engineer's approval, or otherwise, of the surface shall be given immediately prior to the Contractor's intention to start spraying.

Unless otherwise directed by the Engineer, immediately prior to the application of prime coat, the surface of the layer shall be sprayed with water to dampen the surface, but in no case the surface shall be made saturated. If the water is over applied, the surface shall be allowed to dry until dampness is uniform over the entire surface.

In order to bring the surface to be primed to the condition required, water shall be applied in small increments by a distributor. Any water on the surface after spraying shall be allowed to drain away before the prime coat is applied.

No traffic shall be allowed on the prepared surface.

(4) Spraying of Prime Coat and Tack Coat

Soon after the surface to be sprayed has been prepared as specified in Sub-clause 1302 (3) and approved by the Engineer, the edges of the area shall be marked out with a line of string or wire pegged down at intervals not exceeding 15 m on straights or 7.5 m on curves. The prime or tack coat shall be sprayed on to it at the specified rate. Spraying shall be carried out not later than 12 hours after the surface has been prepared.

The quantity of binder used shall give complete coverage of the surface with a slight trace of run-off in places. Shall the specified rate of spray appear to be incorrect, the Contractor shall immediately stop spraying, inform the Engineer and amend the spray rate as instructed by the Engineer.

The temperature for storage and spraying shall be as given in the Table 13.12.

Table 13.8: Temperature for Storage

Type of Prime	Maximum storage temperature ° C	
	Up to 24 hrs.	Over 24 hrs.
Cutback bitumen's		
MC-30	65	40
MC-70	80	50

Bitumen shall be sprayed from a pressure distributor complying with the requirements of Sub-clause 1303 (6) and no spraying shall be permitted except in small areas, or to make good a defective area caused by a blocked nozzle.

The nozzle shall be arranged to give a uniform spray and shall be tested prior to spraying by discharging on to suitable material (such as building paper, metal sheets, etc.,) or into special troughs made for this purpose. Testing shall not take place on the road, and any bitumen spilt on the ground shall be cleaned off.

If during spraying, a nozzle becomes blocked or develops a defect, the spraying shall be made good with a hand spray, and the machine repaired before further spraying is commenced.

When commencing and stopping spraying, sheets of building paper or metal at least 2 m wide shall be spread across the full width to be spread across the full width to be sprayed to give a clean sharp edge.

The metal sheets used for stopping and starting work shall be cleaned after each run and the troughs used for testing shall be cleaned at the end of each day's work.

During spraying all kerbs, road furniture, culvert headwalls, tree boles and the like which are liable to be disfigured by splashing of bitumen shall be protected, and any such feature which is accidentally marred by bitumen shall be cleaned off with a suitable solvent or made good.

(5) Curing and Blinding of Prime Coat

If after application of the prime coat, the bituminous material fails to penetrate within the time specified of if the road must be used by traffic, blinding material shall be spread in the amount required to absorb any excess bituminous material and to protect the primed surface.

Blinding material shall be spread from trucks in such a manner that no wheel shall travel on uncovered bituminous material.

Unless the Engineer permits otherwise, all loose material on the sprayed surface, including any blinding material, shall be removed before any further layer of the pavement is laid.

(6) Tolerances

The actual rate of application of bituminous binder across the width of each spray run shall not vary by more than ±5% of the rate ordered and the actual of application of binder for each single run of the spray shall not vary from this specified rate by more than 0.03 litre per square meter.

(7) Testing

Tray tests shall be taken at least twice a day during priming operation to check calculations based on dipping of spray trucks. The minimum testing frequency for the purpose of process control shall be as given in the Table 5.2

(8) Measurement

Binding material shall be measured in litre. For computation of the quantity following methods shall be adopted.

(a) Designed/instructed rate of application times specified area sprayed, computed in litres corrected to 15.6°C.

(b) Actual rate of application measured through tray tests times specified area sprayed, computed in litres corrected to 15.6°C.

(c) Actual consumption in the specified area sprayed measured in litres corrected to 15.6°C by dip stick reading of the distributor.

The lowest value of the above three methods shall be adopted for payment. However, if the rate of actual spray of binder is much less or more than the designed/instructed rate of spray so appropriate rectification which the contractor shall execute at his own cost.

Emulsion/bitumen and cutter shall be measured on the basis of their percentage actually used in the work.

(9) Payment

Emulsion/bitumen and cutter shall be paid at the respective contract unit rate which shall be the full and the final compensation for compliance of all requirements specified in Clause 1301 and 1302 in addition to those specified in Clause 112.

1303 SURFACE DRESSING

(1) Scope

This Clause covers the application of one or more coats of surface dressing, each coat consisting of a layer of bituminous binder sprayed on a based prepared previously, followed by a cover of stone chipping properly rolled to form a wearing course to the requirements of these Specifications.

A single surface dressing means an application of bituminous binder to the road surface followed immediately by a single layer of uniform sized chippings.

A multiple surface dressing means two or more surface dressing placed one on the other.

(2) Materials

(a) Binder

The binder shall be either bitumen conforming to IS: 73 or rapid setting cationic bitumen emulsion (RS-2) conforming to IS: 8887. Grade of bitumen shall depend upon the climatic condition, for selection of grade of bitumen guidance may be taken from Table 13.1. The type of binder to be used shall be stated in the Contract, or as directed by the Engineer.

(b) Aggregates/ Chippings

The stone chips (cover aggregate) shall confirm the requirement as specified in Table 13.9. They shall be clean, hard, and durable, of cubical shape, free from dust and soft or friable matter, organic or other deleterious substances. Where the Contractor's selected source of aggregates has poor affinity for bitumen, the contractor shall produce test results that with the use of anti- stripping agents, the stripping value is improved to satisfy the specification requirements. The Engineer may approve such a source and as a condition for the approval of the source, the bitumen shall be treated with an approved anti-stripping agent, as per the manufacture's recommendations, at the cost of the contractor. The aggregate shall satisfy the requirements specified in Table 13.13.

Table 13.13: Physical Requirement of Aggregate for Surface Dressing

Property.	Test	Specification / Requirement	Test Method
Cleanliness (dust)	Grain size analysis	Max 1.5% passing 0.075 mm sieve	IS : 2386 (Part-1)
Particle shape	Combine Flakiness and Elongation Indices (Total) *	Max 35 %	IS : 2386 (Part-1)
Strength	Los Angeles Abrasion Value or Aggregate Impact Value	Max 35 5 Max 27 %	IS : 2386 (Part-4

Table 13.13: Physical Requirement of Aggregate for Surface Dressing

Property.	Test	Specification / Requirement	Test Method
Durability	Soundness: Sodium sulphate or Magnesium sulphate *	Max 12 % Max 18 %	IS : 2386 (Part-5)
Water Absorption	Water absorption *	Max 1%	IS : 2386 (Part-3)
Stripping	Coating and stripping of aggregate mix	Minimum retained coating 95 %	IS: 6241
Polishing	Polished Stone Value	Min 60	BS:812-114

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

The size of aggregate shall depend upon the type of surface on which it is laid and the traffic intensity. The Table 13.14 May be used as guidance,

Table 13.14: Recommended nominal size of aggregate (chips) in mm

Type of surface	Traffic intensity in Terms of Number of vehicles per day in the lane under consideration		
	1000-2000	200- 1000	20-200
Very hard	10	6	6
Hard	13	10	6
Normal	13	10	6
Soft	19	13	13
Very soft		19	13

The grading requirements of chipping shall be as specified in the Table 13.15.

Table 13.15: Grading Requirements of Chippings

Sieve size (mm)	Percentage passing by weight			
	Nominal size			
	19	13	10	6
26.5	100			
19.5	85-100	100		
13.2	0-40	85-100	100	
9.5	0-7	0-40	85-100	100
5.6		0-7	0-35	85-100

Table 13.15: Grading Requirements of Chippings

Sieve size (mm)	Percentage passing by weight			
	Nominal size			
	19	13	10	6
4.75			0-10	
3.35				0-30
2.36	0-2	0-2	0-2	
0.6				0-10
0.075	0-1.5	0-1.5	0-1.5	0-1.5

(3) Rate of Application of Binder and Chips

The rate of spray of binder and chips shall be depend upon the nominal size of the aggregate and the extent of its embedded into the surface. The rate shall be determined as per procedure given in "Overseas Road Note- 3, Guide to Surface Dressing in Tropical and Sub-tropical countries". Approximate rate of application of aggregates, and binder under average condition are given in Table 13.16.

Table 13.16: Approximate Rate of Application of Binder and Aggregates

Table 13.16: Approximate Rate of Application of Binder and Aggregates

Nominal Aggregate size mm	Binder (kg/ sqm)			Aggregates cu.m/ sqm
	Uncoated Aggregates		Coated Aggregates	
	Bitumen	Emulsion	Bitumen	
19	1.2	1.8	1.0	0.014 – 0.015
13	1.0	1.5	0.8	0.009 – 0.011
10	0.9	1.3	0.7	0.007 – 0.009
6	0.75	1.1	0.6	0.003 – 0.005

Note: above rate of spray of Bitumen is excluding cutter and Anti-stripping agent, if applicable

The size and rate of spread of chippings shall be as specified in the Special Specification, BOQ or as instructed by the Engineer. Tray tests shall be carried out at least twice per run during surface dressing operations to check spray and spread rates calculated from spray truck chippings and chip spreader coverage, and more frequently when a number of short lengths are being surface dressed. Spray truck dipping and chip-spreader coverage shall be checked for each length sprayed.

(4) . Crushing, Screening, Washing and Stockpiling Chippings.

The construction plant provide and the methods of operating it, shall be such as to

(a) produce chippings which shall meet the specified requirements of Sub-clause 1303 (2)

(b). This may require washing the chippings to meet the cleanliness requirements.

The Contractor shall comply with Section 800 when chipping are stockpiled. If required, the stockpiles area shall be surfaced with 100 mm thickness of gravel or other material, acceptable to the Engineer. Any contaminated chippings shall not be used in the Works. After use the stockpile area shall be cleared, top soiled and left neat and tidy.

(5) Pre-coated Chippings

The bituminous binder used for pre-coated chipping shall be a medium curing cutback MC-30 or a semi-stable or stable emulsion unless otherwise instructed by the Engineer. The amount of bitumen binder used to Pre-coat chipping shall be specified in the Special Specification or shall be as instructed by the Engineer.

Pre-coating shall be carried out in a mixing machine acceptable to the Engineer. The Pre-coated chipping shall not be tacky and liable to agglomerate. The chipping Precoated with cut-back or emulsion shall be stockpiled for the lapse of time required by the solvents or water to evaporate.

The Pre-coated chipping shall be kept free of contamination by dust or other deleterious matter.

(6) Construction Plant for Pavement Works

(a) Bitumen Distributors

Bitumen distributors shall be truck mounted and shall have sufficient power to maintain uniform speeds for the proper application of the binder. The truck shall be equipped with an accurate tachometer showing the driver the speed in meters per minute. The truck shall be fitted with a gauge bar and chain or any other acceptable device clearly visible to the driver to enable him to follow the required edge. The distributor tank shall have a capacity of at least 4,000 litres and shall be fitted with a device for indicating the quantity in the tank at any time. It shall be equipped with heaters capable of maintaining temperatures up to 200oC and be fitted with an accurate thermometer.

The circulation system shall permit pumping around the tank and around the spray bar without actually spraying. Spray bars shall be available for spraying in widths varying from 0.5 m to 4 m and shall be adjustable transversely so that the operator can follow the required edge independently. The spray nozzles shall be arranged to give a uniform spray and the shut-off shall be quick-acting with an antidrip device. The pressure in the spray bar shall be sufficient to give a good distribution and spraying of the binder.

Distributors shall be capable of applying bituminous binder within the limits of ± 5% of the specified rate of application over any portion of the surface.

Distributors shall be checked and calibrated before starting any work or when required by the Engineer. This shall include the calibration of all the metering devices and checking the uniformity of the transverse distribution of spray. All distributors shall be furnished with a "rate of spray/machine speed" chard.

(b) Chip-spreaders

Mechanical chip-spreaders shall be capable of spreading the chippings uniformly over variable widths, from 0.5 to 3.5 m, at the rates specified. The number and output of chip-spreaders shall be sufficient to ensure that chippings are spread immediately after the bituminous binder has been applied. Chip-spreaders shall be checked and calibrated before starting any work or when required by the Engineer.

(c) Rollers

The main rolling shall be carried out with self-propelled pneumatic tyred rollers, having a wheel-load of more than 2 tons. The tyres shall be smooth and their pressure shall be more than 0.4 N/mm2.

Where approved by the Engineer steel-wheeled rollers shall be used in tandem with pneumatic tyred rollers after all excess chippings have been removed and insufficiently chipped areas have been chipped over. Only steel-wheeled rollers weighing less than 8 tons (total weight) shall be accepted.

The number and output of rollers shall be sufficient to ensure that rolling does not lag behind spreading. To the extent possible, two pneumatic tyred rollers shall be used for each chip-spreader.

(d) Miscellaneous Equipment

Sufficient trucks and loading machinery shall be employed to ensure an adequate, prompt and continuous supply of chippings.

Rubber tyred mechanical rotary brooms towed by or mounted on rubber tyred vehicles shall be provided. Tractor toed air compressor with sufficient length of hose pipes and air jet nozzle shall be provided to ensure sufficient cleaning of surface to be sprayed with bituminous layers.

(7) Preparation of Surface

Immediately before spraying, all loose material and foreign matter shall be removed by thorough brushing with mechanical brooms and/or washing or by use of compressors or by other methods acceptable to the Engineer. All hardened mud or other foreign matter shall be loosened by scraping before sweeping. The debris shall be deposited well clear of the surface to be sprayed. Road furniture (manholes covers etc.) shall be covered with adhesive paper or similar materials. Kerb stones, roadside, and any other objects what shall not benefit from binder spray shall be protected in a manner approved by the Engineer.

Any defect of the surface shall be made good as instructed by the Engineer and no binder shall be sprayed until the surface has been approved by the Engineer. The Engineer's approval or otherwise of the surface shall be given immediately prior to the Contractor's intention to start spraying.

(8) Application of Surface Dressing

a) Application of Binder

The specified bitumen binder, cut back if instructed by the Engineer, its application rate and spraying temperature shall be instructed by the Engineer on site after design based on Traffic, Existing surface, climatic condition and type of chippings. The range of spraying Temperature for binder is normally within the range of 1400 to 170^0 C.

The Contractor shall present his detailed program and arrangements and methods for the planning and execution of the surface dressing process to the Engineer for approval at least 28 days before he intends to commence this work. The Contractor's authorized representative shall be responsible for preparation of the programs and arrangements and the Contractor shall not commence surface dressing until the Engineer has approved his program.

All operation associated with the surface dressing process shall be described in the Contractor's arrangements and shall include but not limited to;

- Method of bitumen supply, decanting, cutting back where required, heating and storing, transfer of distributor including list of equipment and capacities
- Location and method of production of cover aggregates and pre-coating with type and output of equipment, including crushers where appropriate; and
- Method of performing the surface dressing process including type and capacity/ weight of all main and ancillary items of equipment along with work force details.

The contractor shall provide, one day in advance his following day's surface dressing work program, including his expected spray lengths and widths for each run with details of the quantity of cover aggregate available in approved chip spreaders standing by at the commencement of the spray run. Spraying shall not commence until sufficient cover aggregate is in this position to cover the area programmed for spraying.

The distributor shall be filled with preheated bitumen binder on the same day, shortly before start of binder application. The distributor spray bar and jets shall be preheated by circulating hot binder and the jets operated for at least 10 seconds for testing. The operation shall be carried out before each spray run, off road onto trays, or at a location where no environmental damage will be created. Jets shall be inspected by the Engineer for shape, direction, blockage or any other defects which shall be corrected before spraying is permitted. At the end of each spray run the distributor shall be driven off- road to avoid binder drip page on the pavement surface. Binder drip page from any location which may contaminate the road surface shall be sufficient for the Engineer to order removal of the offending source from the roadway until repairs are completed.

As emergency/ temporary measures, drip protection of the pavement surface shall be provided by use of buckets/ trays etc. These shall be available for use at all times, along with equipment for removal of binder spillages on the pavement surface, to the approval of the Engineer.

The Contractor shall carry out a trial section of surface dressing at a location instructed by the Engineer to demonstrate to the Engineer that this surface dressing operation is capable of constructing the surface dressing in accordance with Specification. The trial length shall be minimum 200 meters using full spray bar width with full width application of cover aggregate. If the trial section of surface dressing complies with the Specification, the Contractor shall receive payment for the Work in accordance with the Contract as if it were permanent Work. If the trial section of the surface dressing fails to comply with the Specification, the Contractor shall carry out further trials until his surface dressing operation complies with the Specification. No payment will be made for trial sections that do not comply with the Specification. When the Engineer is satisfied that the Contractor is capable of constructing surface dressing that complies with the Specification after trial section, the Contractor will receive permission to commence surface dressing as permanent Work on the road pavement.

Application of binder shall only be under taken when the surface is dry or slightly damp, but no circumstances when wet, If in the opinion of the Engineer rainfall is likely before the application of binder or cover aggregate or the temperature or the pavement surface has time to fall below the specified minimum temperature (normally 150^{o} C), the Engineer will instruct the Contractor to delay surface dressing work until weather conditions are satisfactory. Areas damaged by rainfall shall be rectified by the Contractor without additional payment, in a manner instructed by the Engineer.

If in the opinion of the Engineer the ambient temperature is too cold for surface dressing, the Contractor shall delay this operation until the temperature increases to the specified minimum level.

Building paper or other approved protective material shall be used at the start and finish of each spray run of sufficient width (not less than 600 mm) to enable the distributor to reach its calibrated road speed with spray jets open before discharging binder onto the pavement under treatment. Ends of previous surface treatment runs shall be trimmed back to clean, straight transverse edges and these shall form the start point for

subsequent runs, with completed work suitably protected as described above. Spray runs will be limited to 300 meter length initially until the Contractor demonstrates his ability to plan and execute long length. Spray width shall be calculated allowing for 150 mm longitudinal overlap with adjacent passes and for the width that the following chipping spreader is able to cover. Longitudinal sprayed butt joints will not be permitted. The Contractor shall submit his spray width and length proposal to the Engineer for approval.

During spraying all passing traffic shall be stopped. If spray jets block, or the chipping spreader stops or any other event occurs which may affect the surface treatment process, then the spray bar operator immediately shall stop spraying. When the defective equipment or operation is rectified, spraying may restart with the Engineer's approval.

The distributor shall be dipped and the binder temperature recorded before and after each spray run and spray length and width recorded on approved record sheets. The hot application rate shall be calculated and recorded and checked against the specified rate. The calculated actual rate shall not vary by more than ± 5% from the specified rate. The actual quantity of binder sprayed corrected to 15.6^{o}C shall be calculated.

At least eight clean pre weighted metal spray trays shall be available for sampling the spray rate for each spray run. To ensure that spray runs are parallel with the road pavement the road centreline or edge line shall be marked every 25 meters and string line laid out for the distributor driver to follow with the guide bar attached to his side of the cab.

Where a second surface dressing is specified, the first surface dressing shall be left open to traffic for a minimum period of 21 days and preferably a longer period before applying the second surface dressing unless special approval is obtained from the Engineer for a shorter period. Surplus chippings shall be removed by firm hand brooming or power brooming before applying the second surface dressing.

The spraying widths shall be so selected that the centre line joint of the second surface dressing is offset from that in the first surface dressing by minimum of 300 mm.

Hand pouring pots or hand lances shall be used to touch up carefully any parts of the first surface missed by the distributor/ Chipping spreader, or for the treatment of areas in which the distributor cannot operate and in this case only, chippings may be applied by an approved manual method. Areas damaged by excess bitumen or spillage of diesel or other deleterious material shall be repaired by careful cutting out and removed followed by careful hand poured or hand lance application of binder and chipping in a manner approved by the Engineer.

The second surface dressing shall be under taken when the first surface has been approved by the Engineer after all surplus chippings are removed, repairs carried out and the surface thoroughly cleaned as specified. The procedures to be followed are those specified for surface dressing in this Section.

b) Application of cover Aggregate

The cover aggregate shall be applied at the rate instructed by the Engineer on site in square meters of coverage per cubic meter of loose aggregate after design of the surface dressing.

The cover aggregate shall be applied immediately after the binder is applied and the approval of the Engineer may be applied slightly damp if not pre coated to depress dust and help adhesion. Aggregate applied to sprayed bitumen emulsion shall however be dry.

The cover aggregate shall be applied using approved mechanical spreaders, which shall be tailgate mounted on tipper trucks, pushed spreaders or self-propelled spreaders, specifically manufactured for the purpose and they shall preferably be metered. They shall be capable of uniformly spreading the same speed as the binder distributors during spraying.

The bitumen binder surface shall be covered with cover aggregate closely packed in one layer so that adjacent chippings are touching and no bitumen binder is left uncovered.

A sufficient number of loaded spreaders shall be available at the start of binder application to provide cover aggregate over the whole area programmed for spraying. The Contractor shall not commence spraying unless sufficient loaded spreaders are in place. Aggregate spreading by manual methods will not be permitted except in circumstances where

- Mechanical spreaders cannot operate effectively or safely
- Additional aggregate (back up work) is required
- Breakdown of mechanical spreaders occurs during the spreading operations before stoppage of spraying
- Minor surface repairs are instructed

The spreader shall follow the distributor at an interval not exceeding 10 m for hot binder work and not exceeding 5 m when using bitumen emulsion binder. A back-up vehicle or other approved means shall be constantly in attendance during surface dressing, from which additional aggregate may be hand applied to ensure complete and rapid coverage.

Where an adjoining pass of the distributor is required, no aggregate shall be applied to the binder over a 150-200 mm strip so as to permit subsequent overlap.

Under no circumstances will general brooming of the chipped surface be permitted. Aggregate spillage shall be removed with care and excess aggregate may be brushed off carefully after a minimum 3 days under traffic, after approval of the Engineer.

The cover aggregate shall be rolled with pneumatic multi- tyred power rollers. Pneumatic-tyred roller shall have a wheel load in the 1000 – 2000 kg range. Tyre pressure and sizes shall be in accordance with the manufacture's recommendations and shall be the same on each axle and tyres shall be smooth and in good condition to provide uniform rolling of chippings. The roller shall follow directly behind the spreader and shall continue to roll at speed of approximately 8-10 Kph, so as to provide minimum 6 passes over the entire treated area. Each pass shall overlap the previous pass by minimum half width of roller rolling shall be continued until all cover aggregate particle are firmly bedded. Tyres shall be in good condition and be kept clean and smooth to avoid pick-up of bitumen and chippings.

(9) Aftercare and Control of Traffic

The road shall not be opened to traffic until the binder has attained sufficient viscosity to prevent the stones being whipped off.

The Contractor shall erect temporary traffic restriction signs, barriers and removable bumps or any other device, as instructed by the Engineer, to prevent vehicles traveling too fast over the newly laid surface dressing. Vehicle speed shall be restricted to a maximum of 30 km/h, until there is sufficient adhesion to ensure that the chippings shall not be dislodged by faster vehicles.

Where possible, the traffic shall be distributed across the road so as to obtain uniform polishing of the road surface. After traffic has been permitted to run on the surface dressing for a period of at least two weeks and when instructed by the Engineer, all loose chippings shall be swept and taken away. Windrows of loose chipping shall not be allowed to accumulate at the sides of the road.

(10) Rectification of Defects

If any defect in surface dressing work is found, the reasons of the defect shall be established and keeping them in view the defect shall be rectified as per direction of the Engineer. It required, the Engineer shall ask the contractor for redoing the defective portion.

The Contractor shall rectify or redo the defective work at his own expense.

(11) Tolerance

The final average overall width of the surface dressing measured at six equidistant points over a length of 100 m shall be at least equal to the width specified or instructed. At no point shall the distance between the centreline of the road and the edge of the surface dressing be narrower than that instructed by more than 13 mm.

The actual rate of application of binder across the lane width shall not by more than ± 5% of the rate ordered and for each single run of the spray it shall not vary from the specified rate by more than 0.03 lit per square meter.

The actual rate of application of chipping along and across the lane width for each single run of the chip-spreader shall not vary by more than ± 5% of the rate ordered.

(12) Testing

The minimum testing frequency required for the process control shall be as given in the Table 5.2

Routine inspection and testing shall be carried out to test the materials and workmanship for compliance with the requirements specified in this Section. Any materials or workmanship not complying with the requirements specified, shall be replaced or redone with the materials or workmanship complying with the Specifications or, be repaired so as to comply with the requirements specified.

(13) Measurement

Each coat of surface dressing shall be measured as finished work for the area instructed to be covered, in square metres. Binding material (emulsion/bitumen, Anti-stripping agent, cutter etc. if applicable) shall be measured for adjustment as follows;

(a) Design/instructed rate of application time's specified area sprayed computed in litre corrected to 15.6 oC after deduction of cutter and anti-stripping agent component.

(b) Actual rate of application measured through tray tests times specified area sprayed, computed in litre corrected to 15.6oC. after deduction of cutter and antistripping agent

However, if the rate of actual spray of binder is deviate more than 10 % than the designed/ instructed rate of spray so as to impair quality of surface dressing, the Engineer shall reject the work or shall ask for appropriate rectification which the contractor shall execute at his own cost.

Cover aggregate (Chipping) of each nominal size shall be measured as finished work in sq. m. Anti-stripping agent and Cutter shall be separately measured in litre. Measurement of pre coated chippings shall be as stipulated in the contract.

(14) Payment

The binder (emulsion/ bitumen and cutter) shall be paid as per their respective contract unit rate. Cover aggregate (chippings) of each nominal size as specified shall be paid at their respective contract unit rate. Anti-stripping agent and Cutter if applicable shall be separately paid as per Contract. The pre-coated chipping shall be stipulated in the contract. The Contract unit rate shall be the full and the final compensation for the cost of preparation of surface, to receive binder, heating, mixing with cutter, spraying, rectification wherever required, compliance of all provisions specified in Clause 1301 and 1303 in addition to those specified in Clause 112.

Traffic Signs, Road Marking and Delineators *(DOR-SSRBW SECTION No. 1501)*

Permanent Traffic Signs

(1) Scope

This Clause covers the supply and erection of permanent road traffic signs along the roadside, over the carriageway and crossroads, at interchanges and at the locations indicated on the Drawing or as directed by the Engineer.

(2) Materials

(a) Mounting Posts

Mounting post shall be of either 50 mm internal diameter steel tube of "heavy" category or 78 mm by 38 mm C channel. Structural steel shall comply with the requirements of IS 2062. Steel tube shall comply with IS 1161. Posts constructed form wood or reinforced concrete shall not be accepted.

(b) Bolts, Nuts and Washers

Steel bolts and nuts shall conform to IS 1367. All steel bolts, nuts and washers shall have a hot-dip (galvanized) zinc coating.

(c) Back Support Frames

Unless otherwise specified sign plates shall be supplied with a back support frame of a size and design to avoid the plate being deformed due to wind pressure or manipulation by vandals. The frame shall be made of a steel angle riveted or bolted

to sign plate and shall incorporate brackets to enable the sign plate to be bolted to the sign plate.

(d) Steel Plate

Steel plate shall be 2.00 mm thick and comply with the requirements of IS 1079. After any cutting, welding and punching has been completed all sharp edges shall be uniformly rounded off and smoothed down. All physically adhering contaminants shall be removed and then thoroughly cleaned.

(e) Aluminum Plate

Aluminum plates used for signs shall be of smooth, hard and corrosion resistant aluminum alloy conforming to IS: 736 – Material Designation 24345 or 19000 and shall be 2.00 thick unless otherwise specified. After any cutting, welding and punching has been completed all sharp edges shall be uniformly rounded off and smoothed down. The plate shall be degreased either by acid or hot alkaline etching and all scale/dust removed to obtain a smooth and plain surface. After clearing , metal shall not be handled except by a device or clean canvas glove.

(f) Retro-Reflective Sheeting

The reflective sheeting shall be either "Engineer" Grade or High Intensity reflective sheeting, as specified in the contract. The retro-reflective sheeting shall be of the enclosed lens type consisting of microscopic lens elements embedded beneath the surface of smooth, flexible, transparent, waterproof plastic. The adhesive backing shall be either of pressure-sensitive aggressive tack type requiring no heat, solvent or other preparation for adhesion, or track-free adhesive activated by heat a Heat Lamp Vacuum Applicator in a manner specified by the sheeting manufacture. The adhesive shall form a durable bond to smooth, corrosion and weather-resistant surface of the sign plate such that it shall not be possible to remove the sign sheeting from the sign plate.

The reflective sheeting shall conform to the following requirements:

(i) The sheeting shall have high reflectivity normal to vehicle headlights dependent on the angle of incidence. The reflective material shall be sharp and glareless and directed towards the light source at an approved angle of incidence.

(ii) The surface of the sheeting shall be smooth and flexible. No cracking shall occur when bent. Reflective sheeting shall have high durability under all weather conditions, heat and moisture and be strongly fungus-resistant.

(iii) The sheeting shall not delaminate, blister, crack, peel and chip during the manufacturing process and during its service life.

(iv) The sheeting supplied shall be free from dirt, solid lumps, scales, ragged edges and non-uniformity of colour.

(v) The colour of the sheeting shall be even and free from any spots or loss of colour. The colour shall not fade under local weather conditions during its expected service life.

(vi) Colour of sheeting used must correspond to the colours of the sheeting supplied as samples.

(vii) The reflective surface of the sheeting shall be durable and remain sharp during its expected service life. Bad weather conditions such as rain, dew, etc, shall not reduce the reflectivity.

(viii) The reflective surface of the sheeting shall be easily cleaned with soap and water with no adverse effect on its reflectivity and durability when used on the roads.

(ix) The adhesive used on the backing of the sheeting shall have give a high quality bonding to clean, smooth and grease free aluminium or other sign plates approved by the sheeting manufacturer. The adhesive shall withstand the conditions without allowing the sheeting to peel.

(g) Paints

Zinc chromate primer shall comply with the requirements of IS: 2074. Other types of primer shall comply with NS 190/2045. Enamel paint shall comply with NS 112/2042.

(3) Protective Painting

(a) Steel Surfaces

The prepared surface shall be given two coats of a zinc chromate primer confirming to IS 2074. The first coat shall be applied within 12 hours in the case of wash-primed surfaces and within 4 hours, but before any oxidation of the surface takes place, in the case of abrasive blasted surfaces.

(b) Aluminum Surfaces

Part of the sign plate not covered by the sheeting, including the reverse of the plate shall be applied with protective paint, applied by either stove-enameling or powder-coating process.

(4) Signs

The regulatory, warning and information sign shall be of the standard as detailed in the Drawing or shown in the Traffic Signs Manual (latest publication) published by the Department of Roads. The colour, configuration, size and location of all traffic signs shall be in accordance with the same manual.

The sign shall be either reflectorised or non-reflectorised as shown in the Drawing or instructed by the Engineer.

(5) Manufacturing of Sign and Posts

(a) Non-reflective Sign Faces

Non-reflective sign faces shall be manufactured from steel plate.

The background shall be painted with air-brush technique. The legends, borders, symbols, designs, etc. shall be screen printed.

(b) Retro-reflective Sign Face

Retro-reflective sign faces shall be manufactured from aluminium plate.

The background, legend, borders, symbols, designs, etc. shall be made by applying cut-outs. All the sheeting, except in black, shall be retro-reflective.

(c) Size and Shape of Signs

The size and shape of the signs shall be manufactured in strict accordance with the details provided in the Traffic Sign Manual (latest publication).

Traffic sign faces shall be manufactured as one unit. Traffic signs which are too large to be transported as one unit may, with the approval of the Engineer, be manufactured in sections. The completed sections shall be assembled in the shop prior to delivery to ensure that all sections fit together properly and that the legends are correctly spaced and aligned. Joints in sign faces shall only be provided at locations and to details approved by the Engineer.

(d) Welding

All welding of steelwork shall be carried out in accordance with the standards laid down in Section 2200. Welding shall be done before painting.

(e) Metal Extrusions.

Metal extrusions for sign faces shall be joined together by rivets or bolts. They shall not be joined longitudinally but, if this connot be prevented without excessive waste, they shall be joined neatly and joints staggered. No sections shorter than 500 mm shall be used.

Where aluminum extrusion are to be faced with retro-reflective background material, it shall be pre-applied to individual sections before assembly with the material taken around the face edges of each extension for at least 10 mm. Retro-reflective material shall be heated to facilitate binding around edges without damaging the material. Unless otherwise instructed by the Engineer, letter across the joint between two extrusions shall be avoided.

(f) Galvanizing

Where the galvanizing of structural steel plates, back support frames and posts are specified, it shall be done after welding. Where, however, this is not practicable, the steel sections shall be galvanized before assembly and then welded. All welds shall be thoroughly cleaned, loose material removed and dressed after which the welds shall be coated with two coats of an approved zinc-rich paint. Unless otherwise specificed in the contract, galvanized steel shall not require painting

Where details for the construction of sign faces, the framework of the sign faces and the attachment thereof to the supporting framework are not shown in the Drawing, the Contractor shall design these himself and submit the details to the Engineer for approval before manufacture.

(g) Posts

The total length of the post shall be determined in such a way that the bottom side of the sign is 1.75 m above the carriageway surface. The section of the post shall be as shown on the Drawing or as instructed by the Engineer.

(6) Painting

a. **Colours, Symbols and Legend**

Paint colours, symbols, legend, size of letterings and borders used on road signs shall comply with the Traffic Sign Manual (latest publication).

b. **Preparation of Surfaces and Application of Paint**

The preparation of surface and painting shall be carried out in a manner to ensure that they are free from rust and scale.

Structural steel for sign face supports and frame work shall be given a wire brush surface preparation and painted. Unless otherwise specified, all painting work shall be carried out in accordance with IS: 1477.

c. **Time of Painting**

Painting shall not be carried out more than six months prior to erection.

(7) Storage

All sign faces shall be protected by an easily-removable liner after manufacture. The liner shall be removable by peeling without soaking in water or other solvent and shall be suitable for the type of material used as the sign plate.

All traffic signs or portions of traffic signs shall be carefully handled and stored in a weather-proof storeroom to prevent any permanent deformation or damage to painted surfaces.

Package for shipment shall be in accordance with commercially acceptable standard to prevent movement and chafing. Sign faces shall be protected from scratching, rubbing and other damages. Sign shall remain dry during shipment.

(8) Erection of Traffic Signs

(a) Position

Traffic signs shall be erected in the positions and in the manner as shown on the Drawing or instructed by the Engineer.

(b) Excavation and Backfilling

Excavation for the erection of traffic signs shall be made according to the dimensions shown on the Drawing.

Unless otherwise specified, the foundation for sign mounted on a single post shall be 300 mm x 300 mm and 300 mm deep. The foundation for signs mounted on two or more posts shall be 450 mm x 450 mm and 600 mm deep. The concrete shall be of grade M 10/40 as per Section 2000 of these Specifications. The upper surface of the concrete shall be neatly finished with sufficient fall to ensure proper drainage.

(c) Erection

Traffic signs shall be erected as shown on the Drawing or directed by the Engineer. During erection, the sign faces shall be firmly bolted and protected in order that no bucking or damage is caused during erection, or by the equipment used for erection. Posts to which traffic signs are to be fixed shall

be vertical, and the undersides of traffic signs shall be horizontal after completion of erection.

(d) Field Welding

All welding done during erection shall comply with the requirements for welding during manufacture.

(e) On Site Painting

All painting done after erection shall comply with the requirements for painting during manufacture. All places where the painting work has been damaged before or during erection shall be made good by the Contractor at his own cost to the satisfaction of the Engineer.

(f) Time of Erection

Road traffic signs shall be erected immediately prior to the opening of the road to public traffic unless otherwise decided by the Engineer.

(9) Tests and Standard of Acceptance

The materials shall be tested in accordance with the relevant standards specified and shall meet the prescribed criteria. The Contractor shall furnish necessary test certificates as required by the Engineer.

The work shall conform to the relevant Specifications and shall be to the true lines, levels and dimensions as indicated on the Drawing or as directed by the Engineer.

(10) Measurement

The measurement of permanent traffic signs shall be in numbers of each type of signs supplied and erected in accordance with these Specifications. Excavation, concrete for foundations and backfill shall not be measured. They are deemed included in the measurement of the traffic signs.

(11) Payment

The quantities measured as above shall be paid at the respective contract unit rates for each type of signs. The contract unit rates shall be the full and the final compensation to the Contractor as per Clause 112 and also for the cost of excavation, concrete for foundation, backfill and all other incidental work so as to complete the work as specified.

Delineator Posts (as DOR-SSRBW SECTION NO. 1504)

(1) Scope

The work covers supplying and fixing of delineator posts. The design and painting of the posts shall be in accordance with the Traffic Sign Manual (latest publication).

(2) Materials

The delineator posts shall be constructed of reinforced concrete of grade and M 20/20 in accordance with Section 2000 or as shown in the Drawing. Paint shall be non-reflectorised paint and shall be in accordance with NS 112-2042. Primer shall comply with NS 190/2045.

(3) Manufacturing

Posts shall be manufactured to the dimension shown on the Drawing or as per Traffic Signs Manual (latest publication). Forms shall be smooth and have accurate dimension. The concrete mix shall be placed in the forms and vibrated. The posts shall reinforced as detailed in the Drawing.

The post shall be true to the shape, smooth and without honeycombing or other blemishes. The posts shall be provided with recess.

(4) Erection and Painting

Posts shall be erected after the completion of pavement surfacing. Holes shall be excavated at a distance of 600 mm from the road edge or at locations instructed by the Engineer. The posts shall be placed vertically and square to the road center line. Backfilling shall be compacted in layers not exceeding 150 mm thick right from the bottom of the hole.

The posts shall be applied with a coat of white cement primer and two coats of synthetic enamel paint. The paint shall be applied in 200 mm wide alternate strips of white and black starting from the top.

The posts shall be painted immediately after placing. If specified in the contract or shown in the Drawing the posts shall then be provided with 100 mm x 80 mm reflective element.

(5) Tests and Standard of Acceptance

The material shall be tested in accordance with the relevant standards specified and shall meet the prescribed criteria. The Contractor shall furnish necessary test certificates as required by the Engineer.

The work shall conform to these Specifications and shall be to the true lines, levels and dimensions as indicated on the Drawing or as directed by the Engineer.

(6) Measurement

Each type of posts (with or without reflective element) shall be measured in number. Excavation, preparation of foundation and backfill shall not be measured. They are deemed included in the measurement of posts.

(7) Payment

Delineator posts measured as provided above shall be paid at the contract unit rate for each type of post. The contract unit rate shall be the full and the final compensation to the Contractor as per Clause 112 and also for the cost of excavation, backfill, painting reflecting elements (where specified) including all other incidental costs so as to complete the work as specified.

SECTION 500 – QUALITY CONTROL (DOR SSRBW-1999)

501. SCOPE

This Section covers the Quality Control System and procedures, Quality Assurance Plan, programme of tests, trials, general procedures for acceptance as well as laboratory arrangements and related facilities which are required for the selection and control of the quality of materials and workmanship.

502. CONTRACTOR RESPONSIBLE FOR THE QUALITY OF THE WORKS

All materials incorporated and all workmanship performed shall be strictly in conformity with the requirements of the Specifications and the Contractor shall be responsible for the quality of the works in the entire construction within the contract.

The Contractor shall provide, use and maintain on the Site, throughout the period of execution of the contract, a laboratory with adequate laboratory equipment operated by competent staff for carrying out tests required for the selection and control of the quality of materials and for the control of workmanship in accordance with these Specifications. The list of laboratory equipment to be procured and laboratory facilities to be provided shall be got approved from the Engineer. The Contractor shall assume that tests shall be required on all materials to be used in the works and on all finished works and on all finished works or part of works.

503. QUALITY CONTROL SYSTEM

The Quality Control System comprises the methods, procedures and organization for the Quality Control of the works. The Contractor shall implement the Quality Control System in the following sequence:

(1) Sequence

(a) Complaint testing for materials including laboratory trials,

(b) Complaint testing for methods and equipment prior to the commencement of the work,

(c) Control testing during construction,

(d) Acceptant testing on completed works or parts of the works.

The Contractor shall carry out all necessary tests and shall report to the Engineer the results of such tests before submitting materials and/or finished works or part of works to the Engineer for approval in accordance with this Specification. In certain circumstances, tests may be carried out at the place of manufacture as per the Conditions of Contracts.

For satisfying himself about the quality of the works, quality control tests shall be conducted by the Engineer himself or by any other agencies deemed fit by the Engineer. Additional tests may also be conducted where in the opinion of the Engineer such tests are needed.

Before commencement of the work, the Contractor shall demonstrate a trial run of all construction equipment for establishing their capability to achieve the laid down Specifications and tolerances to the satisfaction of the Engineer.

(2) The supply, testing and monitoring shall be in compliance with a Quality Assurance Plan, Clause 504 and the provisions in the contract.

504. QUALITY ASSURANCE PLAN

The Contractor shall submit to the Engineer for his approval, the Quality Assurance Plan (QAP) which shall be based on the detailed Programme of the Works as per Clause 116 of these Specifications.

The Quality Assurance Plan shall include the following:

(1) The Quality Control Schedule Comprising of:

(a) The recapitulative test schedule and testing programme detailing the list of tests for compliance, laboratory trials, site trials and trials Sections, construction control tests and their frequencies, tests for acceptance of the completed works with their dates.

(b) Recapitulative list of "critical" acceptance testing procedures, for equipment or parts of the works which corresponds to the tasks on the Critical Path according to the construction Programme.

(c) Estimate of the number of tests to be carried out, list and number of appropriate equipment to conduct them, list of tests to be conducted outside the site laboratory, if any, identification of the outside laboratory where proposed to carry out the test.

(d) List of staff assigned to the laboratory, their position and responsibilities in the quality control procedures, their qualification and experience, general description and detailed organization of the laboratory activities.

(2) The list of sources of materials and/or of manufactured articles, their main characteristics, their identification mode as provided by the supplier when required; the programme of supply and procurement of material and/or manufactured articles in accordance with the Programme pursuant to Clause 116.

(3) The list of tests and quality control procedures to be implemented by the Sub-contractors, if any, pointing out the "critical" acceptance testing procedures relating to the Sub-contracted works, which correspond to the tasks on the Critical Path included in the Sub-contracted works.

The Contractor shall implement the Quality Control in compliance with the approved QAP.

The Engineer's approval of the QAP shall not relieve the Contractor from his responsibility of the quality of the Works as per the Conditions of Contract and these Specifications nor shall the Engineer's approval of the QAP exempt the Contractor of any procedure to inform the engineer in writing or request for the Engineer's approval or reapproval as specified in the Conditions of Contract and/or in these Specifications.

The Contractor shall monitor and update the QAP on the basis of the decisions taken at the periodic review meetings or as directed by the Engineer and in accordance with the programme of the works as per Clause 116 and the Conditions of Contract.

505. TESTING PROCEDURES AND SETS OF TESTS

For ensuring the quality of the work, the materials and the workmanship shall be subjected to testing in accordance with procedures, sets of tests and frequencies are not restrictive. The Engineer shall direct for the tests to be carried out as frequently as deemed necessary that the materials and workmanship comply with their Specifications.

Sets of tests to be carried out on the materials and the workmanship as specified in these Specifications are recapitulated in Clause 510. Where no specific testing procedure is mentioned in the Specifications, the tests shall be carried out as per the prevalent accepted engineering practice or directions of the Engineer.

506. LABORATORY TRIALS TO CONFIRM COMPLIANCE WITH SPECIFICATIONS

i. Filling and Pavement Materials

Laboratory trials shall be carried out by the Contractor on filling and pavement materials proposed to be used in the works in their natural state. The laboratory trials shall establish a relationship between their specified requirements of the end product and properties which can be determined in the field for construction control purposes.

Laboratory mixes and site trials for bituminous mixes shall be carried out in accordance with the requirements of the Sections 600.

The mixed materials, the composition of which meets the specified requirements and is accepted by the Engineer, shall then be used in the site trials carried out in accordance with Clause 507 to ensure that all specified requirements of the completed pavement courses can be achieved.

The Contractor shall submit the proposals for the site trails to the Engineer at least two weeks before he intends to use the mixed materials in the site trials in accordance with Clause 507.

ii. Concrete

Laboratory trials for concrete mixes as specified in Clause 2004 shall be carried out by the Contractor to demonstrate that the compostion of the mixes proposed for the concrete meets the requirements of the Specifications.

The compositions of concrete mixes which meet the specified requirements and are accepted by the Engineer shall be then used in the site trials carried out in accordance with Clause 507.

507. SITE TRIALS OR TRIAL SECTIONS

i. Earthworks and Pavement Materials

Site trails for laying and compaction shall be carried out by the Contractor on all earthworks and pavement materials proposed for the works, using the same constructional plant and methods proposed by the Contractor for use in the works. The trials shall demonstrate the suitability of the method and equipment for laying and compacting the material to the specified density and confirm that other specific requirements of the completed earthwork or pavement work can be achieved.

Each trial area shall be at least 100 metres long and to the full construction width and shall be laid to the specified depth for the material. It may form a part of the works provided it complies with the required Specifications. Any areas, which do not comply with the Specifications shall be removed and new trial shall be made.

The Contractor shall allow in his programme for conducting such site trials and for carrying out the appropriate tests on them in accordance with the Quality Assurance Plan. The trials on each pavement layer shall be undertaken at least 21 days ahead of the commencement of the related work.

The Contractor shall compact each section of the trial over the range of compactive effort the Contractor is proposing. The data in respect of the following shall be recorded for each level of compactive effort at each site trial:

(a) The composition and grading of the material before the site trial.

(b) The composition and grading of the material including the lime or bitumen content.

(c) The moisture content at the time of compaction and the optimum moisture content for the specified compaction.

(d) The type, size, tyre pressures, frequency of vibration and the number of passes made by the compaction equipment.

(e) The maximum dry density or target density as appropriate measured on a sample before and at intervals through the site trials.

(f) The density achieved.

(g) The compacted thickness of the layer.

(h) Any other relevant information as directed by the Engineer.

At least, eight sets of tests shall be made by the Contractor on each 100 metres length of trial section for each level of compactive effort. If all eight sets of results over the range of compactive effort proposed by the Contractor meet the specified requirements for the material, the site trial shall be deemed successful. The above data recorded in the trial shall become the agreed basis on which the particular material shall be provided and processed to achieve the specified requirements. If required, the QAP shall be updated or modified on the basis of these data.

If, during the execution of the works, the construction control tests indicate that the requirements for a material are not being consistently achieved, then work on that layer shall be stopped until the cause is investigated by the Contractor. Such investigation may include further laboratory and site trials on the materials to determine a revised set of data as stated above which when agreed, shall be the basis on which all subsequent material shall be provided and processed to achieve the specified requirements.

ii. Concrete

Site trials for concrete mixes as specified in Clause 2004 shall be carried out by the Contractor to demonstrate the suitability of his mixing equipment. During the site trials, compliance with the Specifications for weighing equipment, storage of ingredients, means of transport for concrete, placing, compaction and curing shall be checked by the Engineer.

During the site trial a full scale sequence including placing and compaction of concrete shall be carried out on a part of the works which will represent particular difficulties due to the presence of reinforcement, obstructions or others.

The Contractor shall allow in his programme for conducting the site trials and for carrying out the appropriate tests, including the time required to obtain compressive strength test results at 28 days. The Contractor shall inform in writing the Engineer at least two weeks before the date he proposes to use the concrete mixes in the site trials with all relevant data including the trial programme, the results of the laboratory trial tests for the proposed concrete mixes and compliance tests results of all constituents i.e. cement, aggregates, water and admixtures, if any.

iii. Production of Materials and Crushing Plant

Full scale site trials corresponding to one day production shall be carried out by the Contractor on all type of materials to be processed using the crushing plant, related devices and methods to

demonstrate the suitability of the equipment to provide materials of the characteristics and performances specified in these Specifications.

At each stage of the processing, materials shall be sampled, and the following characteristics shall be determined in the laboratory and recorded:

(a) the grading of the material

(b) characteristics of the fine fraction : Sand Equivalent (SE): Mica Content; and if SE<40, Plasticity Index.

(c) Characteristics of the coarse fraction : LAA, AIV, ACV, FI, Adhesivity test, Crushing Ratio.

At least three sets of tests shall be conducted by the Contractor at each stage of the production. If all the three sets of results over the full sequence of production proposed by the Contractor meet the specified requirements for the materials, the site trial shall be deemed successful.

iv. Other Works and Equipment

Site trials for Prestressed Concrete Works, Painting of Structural Steelwork etc. are detailed in the relevant Sections of these Specifications.

Approval of the Engineer to a set of data recorded in a site trial shall not relieve the Contractor of his responsibilities to comply with the requirements of these Specifications

508. CONTROL TESTING DURING CONSTRUCTION

i. Earthworks and Pavement Materials, Backfill to Drainage and Other Structures

All earthworks, pavement layers, and backfill to drainage and other structures shall be subject to control testing (process control) including, if required, testing by the Engineer in accordance with the Conditions of Contract and Clause 503. The Contractor shall allow in his programme or sequence of operations for any disturbance or delays occasioned by such control and testing.

ii. Other Works and Equipment

Quality Control procedures are detailed in the relevant Sections of these Specifications.

509. ACCEPTANCE TESTS FOR COMPLETED WORKS OR PARTS OF THE WORKS

i. Earthworks and Pavement Materials, Backfill to Drainage and Other Structures

The Contractor shall request, in writing for the Engineer's approval for each layer of each section of earthwork, pavement construction and backfill to drainage and other structures. Such requests shall be made only when the Contractor is fully satisfied that the section of the works concerned is in the condition required by the relevant Specifications. Such request shall be accompanied by the tests results required by the Sub-clause 503 (1) (a), (b), (c) and the relevant Sections of these Specifications.

The Engineer shall thereupon, without undue delay, inspect the Section for any visible defects including, heaving material (visible during compaction or on proofrolling) segregation, and for the uniformity of the mixing and compaction. If the visual aspects are satisfactory the Engineer shall test the Section of the works submitted and inform the Contractor in writing of the results of the tests specifying acceptance or rejection of the Section or the layer concerned.

Work on a layer shall in no circumstances commence until the preceding layer has been approved and accepted by the Engineer in writing. The Contractor shall be fully responsible for protecting and maintaining the condition of the work which has been submitted for approval.

Should any layer be left unprotected for more than 24 hours subsequent to approval, the Contractor shall request for reapproval of the layer and the layer shall again be subject to proofrolling, construction control testing, and tolerance checks in accordance with these Specifications.

Notwithstanding the Engineer's approval of a layer, the Contractor shall be responsible for making good any subsequent damage due to traffic, ingress of water or any other reason and should any damage occur the layer shall again be subject to proofrolling, construction control testing and tolerance checks in accordance with these Specifications.

ii. Other Works and Equipment

Acceptance tests for other works and equipment are detailed in the relevant Sections of these Specifications.

510. RECAPITULATIVE SCHEDULE OF TESTS

The tests to be carried out and their frequency for the quality control of the works are detailed in the relevant Sections of these Specifications.

The following Table 5.1 recapitulates the testing schedule for the main types of works.

Table 5.1: Testing Schedule

PART OR COMPONENT OF THE WORKS	Section/ Clause No.	TESTS	FREQUENCY
PIPE DRAINS, PIPE CULVERTS AND CONCRETE CHANNELS MATERIALS FOR RE-FILLING THE TRENCHES	700 701	IDENTIFICATION : Gradation, Plasticity Index, CBR In-Situ Density (95% MDD)	As specified or required by the Engineer
PRODUCTION OF MATERIALS NATURAL AND CRUSHED MATERIALS	800	• Site Trials: • Other tests on materials	• Before starting production • According to the relevant component of the works
EARTHWORKS FILL MATERIAL COMPACTION	900	• Material Identification, MDD, OMC, CBR • MC • Field Density	• For each new source and in every 1500 m3 or part of it • For each new source and in every per 250 m3 or part of it • One set per 500 m2 of each layer with a minimum 3 test per Section
SUBGRADE UNTREATED SUBGRADES, CAPPING LAYERS MATERIALS COMPACTION	1000 1003 & 1004	• Material Identification, MC MDD, OMC, CBR • Field Density	• For each new material and not less than once per 3000 • Once per 250 m2 of each layer or part of it.
MECHANICAL STABILISATION IN-SITU MATERIAL	1005	• Material Identification, MC MDD, OMC, CBR	• One test for each new material and one test

STABILISER MIXED MATERIAL COMPACTION		• Grading, ES (for sand) • MDD, OMC, CBR, MC • Field Density	per 3000 m2 of each layer or part of it. • One test for each new source and one test per 500 m3 of additive material or part of it. • One test for each new material and one test or part of it. • Once per 250 m2 of each layer or part of it.
LIME STABILISATION IN-SITU MATERIAL LIME MIXED MATERIAL COMPACTION	1006	• Material Identification, MC, OMC, CBR • Quality of Lime • MDD, OMC, CBR, MC • Field Density	• One test for each new material and one test per 3000 m2 of each layer or part of it. • For each consignment delivered at the site. • One test for each new material and one test per 400 m2 of each layer or part of it. • Once per 250 m2 of each layer of part of it.
SUBBASE, BASE, HARD SHOULDER AND GRAVEL WEARING COURSE MECHANICALLY STABLE MATERIALS FOR SUBBASE MATERIALS	1200 1201	• Material Identification, MC, Gradation, Plasticity index,	• Once per 200 m3 or part of it and change in source with a minimum

COMPACTION		• MDD, OMC • Field Density and moisture content	of 2 tests per Section. • Once per 1000 m3 or part of it and change of source, with a minimum of 2 tests per Section. Once per 500 m2 of each layer with a minimum of 2 tests per Section.
GRADED CRUSHED STONE FOR BASE AND SUBBASE MATERIALS COMPACTION	1202	• Material Identification, MC, Gradation, Plasiticity Index, FI • LAA, AIV, Crushing Ratio, • SSS, CBR • MDD, OMC • Field Density and moisture content	• Once per 200 m3 or part of it and change in source with a minimum of 2 tests per Section • Once per 200 m3 or part of it and every change of source • Once per 500 m3 or part of it & every change of source, • Once per 1000 m3 or part of it & every change of source, with a minimum of 2 tests per Section. • Once per 500 m2 of each layer with a minimum of 2 tests per Section.
WATER BOUND MACADAM BASE AND SUBBASE MATERIALS COMPACTION	1203	• Material Identification, Gradation, Flakiness Index, • LAA, AIV • Field Density and moisture content	• Once per 200 m3 or part of it and change in source with a minimum of 2 tests per Section • Once per 200 m3 or part of it and change in source. • Once per 500 m2 of each layer with a minimum of 2 tests per Section.

GRAVEL WEARING COURSE MATERIALS COMPACTION	1205	• Material Identification, Gradation, Plasticity Index, CBR, LAA, AIV • MDD,OMC • Field Density and moisture content	• Once per 300 m3 or part of it and for each new source • Once per 400 m3 or part of it and for each change in sources • Once per 200 m2 of each layer with a minimum of 3 test s per Section.
BITUMINOUS SURFACE AND BASE COURSE PRIME COAT – TACK COAT MATERIALS CONSTRUCTION	1300 1302	• Quality of Binder • Binder temperature for application • Rate of spread of binder	• Certificates from suppliers. • One set of tests for each 50,000 litres of supply or part of it • At regular close intervals • 2 tests per run
SURFACE DRESSING MATERIAL	1303	• Material Identification, Gradation, FI • LAA, AIV,CR • Degradability test, SSS • Striping Value	• Once per 50 m3 or part of it and change in source • Once per 250 m3 or part of it and change in source • Once per 500 m3 or part of it and change in source • One set of 3 specimens for each source of supply. Then, when warranted, by change in the quality of aggregates.

PART OR COMPONENT OF THE WORKS	Section/ Clause No.	TESTS	FREQUENCY
SAND ASPHALT MATERIALS	1309	• MaterialIdentification, Gradation, Sand Equivalent Quality of Filler • Quality of Bitumen Penetration test • Mixture Grading and Bitumen Content Marshall stability, • Control of temperature	• Once per 100 m3 or part of it and change in source • Once per 500 m3 or part of it and change in source • Per 50 tonnes or part of it and change in source • Certificates from suppliers. • One set of tests for each 50,000 litres of supply or part of it • At close intervals as directed by Engineer. • Each 100tonnes of mix or part of it • As required
CONSTRUCTION			
EMULSION AGGREGATE MIX MATERIALS	1310	• Material Identification, Gradation LAA, SSS, SE Quality of Filler • Emulsion Water Content Sieve test • Mixture Grading and Bitumen Content Marshall stability, flow or Duriez test	• Once per 100 m3 or part of it and change in source • Once per 500 m3 or part of it and change in source • Per 50 tonnes or part of it and change in source • Certificates from suppliers. • One set of tests for each 20,000 litres of supply or part of it. • Each 100 tonnes of mix or part of it

CONSTRUCTION		• Compaction	• Each 100 tonnes of mix or part of it • Each 100 tonnes of mix or part of it • Each 100 tonnes of mix or part of it • Per 500 m2 or part of it
COLD ASPHALT MATERIALS CONSTRUCTION	1311	• Material Identification, Gradation, LAA, ACV, SSS, SE Flakiness Index Quality of Filler • Emulsion Water Content Sieve test • Mixture Grading and Bitumen Content Marshall stability, flow and voids • Compaction	• Once per 100 m3 or part of it and change in source • Once per 500 m3 or part of it and change in source • Once per 100 m3 or part of it and change in source • Per 50 tonnes or part of it and change in source • Certificates from suppliers. • One set of tests for each 20,000 litres of supply or part of it. • Each 100 tonnes of mix or part of it • Each 100 tonnes of mix or part of it • Each 100 tonnes of mix or part of it • Per 500 m2 or part of it

CONCRETE MATERIALS	2000	• Cement : Acceptance tests: CONTROL TESTS: Chemical composition Physical properties • Aggregates : Acceptance tests: CONTROL TESTS: Grading Silt &clay content Organic Impurities Chloride content, sulphate content, Alkali reactivity Water, Admixtures	• Conservative samples for each supply and not less than every 200 t or part of it. • Testing in case of non compliance of the mixes or storage on site for longer than 1 month • Sub- clause 2003 (5) • Each delivery and every 100 t or part of it for fine aggregate and 250 t or part of it for coarse aggregate • As frequently as required. • Sub-clause 2003 (7) and (8)
		CONCRETE • LAB. TRIALS • SITE TRIALS • Control tests • Compressive strength	• Sub-clause 2401 (4) • Sub-clause 2401 (4) • Earth works: Every 6 m^3 of each class. When compliance is established: every 20 m^3 or part of it.
		REINFORCEMENT:	Clause 2014

MISCELLANEOUS STRUCTURES	2400		
GABIONS MATERIALS	2401	• Gabion wires: Tensile Strength, Mass, Uniformity and adhesion of Zinc coating	• Sub-clause 2401 (4)
		• Specific gravity and water absorption of stones	• Sub-clause 2401 (4)
		• Dismantling of gabion boxes for workmanship	• Every 50 m3 or part of it
CRIB WALLS	2402	• Gradation of backfill material	• Minimum one test for every 250 m3 or part of it and for each source of material
SUB-SURFACE DRAIN	2404	• Gradation Analysis	• One set of test for every 50 m3 and or part of it and for each change in source of material
BRICKWORKS FOR STRUCTURES			
MATERIALS	2502	• Quality of Bricks • Quality of cement and sand	• As required • Every 10 m^3 of brick work or part of it.
MORTAR	2511	• Control tests Compressive strength of mortar	
MASONRY FOR STRUCTURES MATERIALS	2602	• Quality of cement and sand • Control tests	• As required.
MORTAR	2610	Compressive strength of mortar • Dismantling of masonry (1m_1m)	• Every 10 m^3 masonry of part of it. • Every 30 m^3 masonry of part of it.

Drawings

• Drawings will be available in separate volume i.e. Volume III of the Bidding Document for Inspection.
• Note: -
1. Hard Copies of Drawings shall be available for inspection at:
District Level Project Implementation Unit (DLPIU/GMaLI), Hetauda, Makwanpur
Phone No: 057-521052 (during office hour).
Email : dlpiumakwanpur@gmail.com
2. Copies of drawing will be provided upon request of bidder.
3. It is recommended to go through the available Drawings before entering any rate in the Bill of Quantities.

SECTION-VII
Bill of Quantities

Preamble of Bill of Quantities

A. General

1. The Bill of Quantities shall be read in conjunction with the Instructions to Bidders, General and Special Conditions of Contract, Technical Specifications, and Drawings.

2. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Project Manager and valued at the rates and prices bid in the priced Bill of Quantities, where applicable, and otherwise at such rates and prices as the Project Manager may fix within the terms of the Contract.

3. For any item for which measurement is based on records made before or during construction the records shall be prepared and agreed between the Engineer and the Contractor. Should the Contractor carry out such work without the prior agreement of the Engineer, the Engineer may request the Contractor to carry out investigations to confirm the extent of the work and the quantity of work certified for payment shall be solely at the Engineer's discretion. The cost of any such investigation shall be borne by the Contractor.

4. The rates and prices bid in the priced Bill of Quantities shall, except as otherwise provided under the Contract, include all construction equipment, labor, supervision, materials, erection, maintenance, insurance, profit, taxes, and duties, together with all general risks, liabilities, and obligations set out or implied in the Contract.

5. A rate or price shall be entered against each item in the priced Bill of Quantities, whether quantities are stated or not. The cost of items against which the Contractor has failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities.

6. The whole cost of complying with the provisions of the Contract shall be included in the Items provided in the priced Bill of Quantities, and where no Items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related Items of Work.

7. General directions and descriptions of work and materials are not necessarily repeated nor summarized in the Bill of Quantities. References to the relevant sections of the Contract documentation shall be made before entering prices against each item in the priced Bill of Quantities. The Specification Clause references where given in the item description of the Bills of Quantities are for the convenience of bidders and generally refer to the principal relevant- specification clause but do not necessarily represent the whole of the specification requirements for the work required within the item. The presence of a Specification clause reference shall not in any way reduce the Bidders obligation to complete work in accordance with all the requirements of the Specification.

8. Provisional Sums included and so designated in the Bill of Quantities shall be expended in whole or in part at the direction and discretion of the Project Manager in accordance with the Conditions of Contract.

9. The method of measurement of completed work for payment shall be in accordance with the Specifications.

B. Day work Schedule

a) General

1. Work shall not be executed on a day work basis except by written order of the Project Manager. Bidders shall enter basic rates for day work items in the Schedules. These rates shall apply to any quantity of day work

ordered by the Project Manager. Nominal quantities have been indicated against each item of day work, and the extended total for day work shall, be carried forward as a Provisional Sum to the Summary Total Bid Amount. Unless otherwise adjusted, payments for day work shall be subject to price adjustment in accordance with the provisions in the Conditions of Contract.

b) Day work Labor

1. In calculating payments due to the Contractor for the execution of day works, the hours for labor will be reckoned from the time of arrival of the labor at the job site to execute the particular item of day work to the time of departure from the job site, but excluding meal breaks and rest periods. Only the time of classes of labor directly doing work ordered by the Project Manager and are competent to perform such work will be measured. The time of gangers (charge hands) actually doing work with the gangs will also be measured but not the time of foremen or other supervisory personnel.
2. The Contractor shall be entitled to payment in respect of the total time that labor is employed on day work, calculated at the basis rates entered by it in the " SCHEDULE OF DAY WORK RATES: 1. LABOR". The rates for labor shall be deemed to cover all costs to the Contractor including (but not limited to) i) the amount of wages paid to such labor, transportation time, overtime, subsistence allowances, ii) any sums paid to or on behalf of such labor for social benefits in accordance with Nepal law, iii) Contractor's profit, overheads, superintendence, liabilities and insurance and iv) charges incidental to the foregoing.

c) Day work Equipment

1. The Contractor shall be entitled to payments in respect of Constructional Plant already on site and employed on day work at the basis rental rates entered by him in the “SCHEDULE OF DAY WORK RATES:2 EQUIPMENT ”. The said rates shall be deemed to include due and complete allowance for depreciation, interest, indemnity and insurance, repairs, maintenance, supplies, fuel, lubricant, and other consumables and all overhead, profit and administrative costs related to the use of such equipment. The cost of drivers, operators and assistants also shall be included in the rate of the equipment and no separately payment shall be made for it.
2. In calculating the payment due to the Contractor for Constructional Plant employed on day work, only the actual number of working hours will be eligible for payment, except that where applicable and agreed with the Project Manager, the travelling time from the part of the Site where the Construction Plant was located when ordered by the Project Manager to be employed on day work and the time for return journey there to shall be included for payment.

d) Day work Materials

1. The Contractor shall be entitled to payment in respect of materials used for day work (except for materials for which the cost is included in the percentage addition to labor costs as detailed heretofore), at the rates entered by him in the "SCHEDULE OF DAY WORK RATES: 3 MATERIALS" and shall be deemed to include overhead charges and profit as follows;

(i) the rates for materials shall be calculated on the basis of the invoiced price, freight, insurance, handling expenses, damage, losses, etc. and shall provide for delivery to store for stockpiling at the Site.

(ii) the cost of hauling materials for use on work ordered to be carried out as day work, from the store or stockpile on the Site to the place where it is to be used also shall be include in the same rate.

C. Provisional Sums

A general provision for physical contingencies (quantity overruns) may be made by including a provisional sum in the Summary Bill of Quantities. Similarly, a contingency allowance for possible price increases should be provided as a provisional sum in the Summary Bill of Quantities. The inclusion of such provisional sums often facilitates budgetary approval by avoiding the need to request periodic supplementary approvals as the future need arises. Where such provisional sums or contingency allowances are used, the SCC should state the manner in which they will be used, and under whose authority (usually the Project Manager's).

The estimated cost of specialized work to be carried out, or of special goods to be supplied, by other contractors should be indicated in the relevant part of the Bill of Quantities as a particular provisional sum with an appropriate brief description. A separate procurement procedure is normally carried out by the Employer to select such specialized contractors. To provide an element of competition among the Bidders in respect of any facilities, amenities, attendance, etc., to be provided by the successful Bidder as prime Contractor for the use and convenience of the specialist contractors, each related provisional sum should be followed by an item in the Bill of Quantities inviting the Bidder to quote a sum for such amenities, facilities, attendance, etc.

Bill of Quantities

1 Provisional Sum

Procument Item Details

SL. No	Item Description	Unit	Quantity	Unit Rate(NPR)	Amount(NPR)
1	Carry out additional tests for material and works as required and instructed by the Engineer.(GCC Clause No. 33.1)	PS	1.0	100000.0	100,000.00
2	Relocation of the utilities (water supply, electric pole, telephone, electric pole etc,) and services as instructed by the Engineer as per DoLIDAR-Technical Specifications for Labour Based Construction Work of Agricultural & Rural Roads (Tech. Spec. for LBCWARR Clause No. G-10.	PS	1.0	300000.0	300,000.00
3	Environmental Mitigation Works as Instructed by the Engineer(DOR Section 109)	PS	1.0	500000.0	500,000.00
4	Social Compiliance and safegaurds as instructed by the Engineer(DOR Section 109)	PS	1.0	300000.0	300,000.00

2 Construction work

2.1 Road Construction Work

Procument Item Details

SL. No	Item Description	Unit	Quantity	Bidder's Rate (NPR)	Bidder's Rate (in words)	Total Amount (NPR)
1	Insurance of works, plants, materials, loss and damage to equipments, Contractor's workmen and employees and third party insurance against damage to other persons and property as per GCC clause 13.	L.S.	1.0			
2	Provide site office suitable locations acceptable to the project manager within the contract package with accommodation facilities as specified in special provision	Month	18.0			
3	Provide and installation of project information board of size 1.80 mx1.2 m along with iron posts including excavation, concreting, backfilling etc all complete as per DoR Standard Specification for Road and Bridge Works (SSRBW) July 2001,Section-108	No	2.0			
4	Provision and maintenance of labour camps payable monthly in equal instalments as per DoR Standard Specification for Road and Bridge Works (SSRBW) July 2001,Section-109 (3)	Month	18.0			
5	Establish, maintain and operate labaratory at the site with equipments furnishing required for testing specified quality of the materials as per DoR-SSRBW, Section-511	L.S.	1.0			

Procument Item Details						
SL. No	Item Description	Unit	Quantity	Bidder's Rate (NPR)	Bidder's Rate (in words)	Total Amount (NPR)
6	Clearing and Grubbing including cutting of all types of plants as per DoLIDAR-Technical Specifcations for Labour Based Construction of Agricultural and Rural Raods (Tech. Spec. for LBCWARR) Clause No.: 1-1.5(a), 1-1.5(b) & 1-1.6	Sqm	72810.0			
7	Dismantling of culverts, bridges, pavements and other structures. The operations covered are dismantling, excavation, back filling, stacking, disposing,handling and haulage up to a lead of 100 m along the lead route. The activity includes safety precautions and incidentals as per DoLIDAR Technical Specification for LBCWARR Clause 1 : (a) Dismantling of Stone masonary as per DoLIDAR-Tech. Spec. for LBCWARR Clause No.1-2 a	Cum	46.88			
8	Dismantling of culverts, bridges, pavements and other structures. The operations covered are dismantling, excavation, back filling, stacking, disposing,handling and haulage up to a lead of 100 m along the lead route. The activity includes safety precautions and incidentals as per DoLIDAR Technical Specification for LBCWARR Clause 1 : (b) Dismantling Gabion works	Cum	120.0			
9	Dismantling of culverts, bridges, pavements and other structures. The operations covered are dismantling, excavation, back filling, stacking, disposing,handling and haulage up to a lead of 100 m along the lead route. The activity includes safety precautions and incidentals as per DoLIDAR Technical Specification for LBCWARR Clause 1 : (c) Dismantling of Concrete, as per DoLIDAR-Tech. Spec. for LBCWARR Clause No. (1-2 b)	Cum	180.0			
10	Reconstruction of existing Stone masonary work with reuse of stones/rubbles from existing ones.	Cum	14.06			
11	Reconstruction of existing Gabion works with reuse of stones/rubbles from existing ones.	Cum	36.0			
12	Excavation in roadway and drain in all types of soil and rock materials including removal and satisfactory disposal of all materials at approved environmentally safe tipping area as per DoR SSRBW 905 & 906	Cum	249842.75			
13	Excavation in foundation in structure in all types of soil materials including removal and satisfactory disposal of all materials at approved environmentally safe tipping area as per DoR SSRBW 907	Cum.	9566.74			

Procument Item Details						
SL. No	Item Description	Unit	Quantity	Bidder's Rate (NPR)	Bidder's Rate (in words)	Total Amount (NPR)
14	Formation of embankments including compaction in layers not exceeding 150 mm compacted depth, watering and haulage 10 m etc. as per DoR SSRBW 909	Cum	54642.12			
15	Supply machine made fabrication of gabion boxes of different sizes with hexagonal mesh size of 100 mm x 120 mm including rolling, cutting and weaving (mesh wire 3.0 mm, selvedge wire 3.9 mm, binding wire 2.4 mm, all heavy zinc coated wires),assembling, placing in position, packing and filling of gabion create with rubble stone and tying by 2.4 mm binding wires all complete as per DoLIDAR-Tech. Spec. for LBCWARR Clause No. 17-1.4, 17-5 & 17-6	Cum	8319.75			
16	Provide and place Geo-textile all complete as per drawing and specifications as per (DOR-SSRBW Section No.: 2404,3110)	Sqm	4587.5			
17	Supply & place un-coursed random rubble stone masonry works in MM 5 (1:4) cement sand mortar in the line & level all complete stone masonry work including full compensation for all labour, materials and other incidentals required to complete the work as per the specifications and drawings. It includes full compensation for using hammer dressed stones on the face of wall with batter and provisions for weep hole as necessary as per DoLIDAR-Tech. Spec. for LBCWARR Clause No. 8	Cum	11966.87			
18	Providing and placing plum concrete with 60% M 15/40 concrete and 40% boulder stones as per specification. Lead 30m lift 1.5m using concrete mixture & Vibrator	Cum	144.69			
19	Supply and Place graded filter material in backfilling for structures and cross drainage works	Cum	962.28			
20	Supply & place P.C.C. works M 10/40 as per DoLIDAR-Tech. Spec. for LBCWARR Clause No. 11	Cum	566.75			
21	Supply & place P.C.C. works M 15/40 as per DoLIDAR-Tech. Spec. for LBCWARR Clause No. 11	Cum	3398.49			
22	Supply & place P.C.C. works M 20/20 as per DoLIDAR-Tech. Spec. for LBCWARR Clause No. 11	Cum	202.7			
23	Supply & place P.C.C. works M 25/20 as per DoLIDAR-Tech. Spec. for LBCWARR Clause No. 11	Cum	34.26			
24	Supply and place formwork for concrete works with all complete as per DOLIDAR Item 39-9-a	Sqm	289.45			

Procument Item Details						
SL. No	Item Description	Unit	Quantity	Bidder's Rate (NPR)	Bidder's Rate (in words)	Total Amount (NPR)
25	Supply & place TMT high tensile strength steel reinforcement of specified grade (Fe 500) for RCC works including bending, centring & binding in position as per DoLIDAR-Tech. Spec. for LBCWARR Clause No. 10	Kg	10513.06			
26	Supply and Place stone packing/Soling as per DoLIDAR-Tech. Spec. for LBCWARR Clause No. 17-1.4, 17-5 & 17-6	Cum	229.24			
27	Supply, Laying, fitting and fixing of hume pipe class NP3. It includes all operations required to complete the work and the jointing of pipes with 1:2 cement sand mortar as per DoLIDAR-Tech. Spec. for LBCWARR Clause No. 15-5 and 15-6 : 450 mm diameter pipe as per DOLIDAR Item no 47-15-5,15-6-b	Rm	75.0			
28	Supply, Laying, fitting and fixing of hume pipe class NP3. It includes all operations required to complete the work and the jointing of pipes with 1:2 cement sand mortar as per DoLIDAR-Tech. Spec. for LBCWARR Clause No. 15-5 and 15-6 : 600 mm diameter pipe as per DOLIDAR Item no 47-15-5,15-6-b	Rm	75.0			
29	Supply, Laying, fitting and fixing of hume pipe class NP3. It includes all operations required to complete the work and the jointing of pipes with 1:2 cement sand mortar as per DoLIDAR-Tech. Spec. for LBCWARR Clause No. 15-5 and 15-6 : 900 mm diameter pipe as per DOLIDAR Item no 47-15-5,15-6-b	Rm	360.0			
30	Back filling in layers in foundation pits,trenches,etc, including compaction and watering etc. complete,lead 10m As per Dor activity no 9.10,clause no 908.	Cum	1551.51			
31	Supply & place160 mm Dia. HDPE Pipe(6kg/cm2) for sub-surface drain and additional purpose etc as per Nepal Standard & directed by Engineer	rm	200.0			
32	Providing and installing tarfelt sheet including all necessaary axilliary and incidental works etc. complete as per drawing and specification	Sqm	12.08			
33	Preparation of subgrade for rehabilitation works as per DoR-SSRBW (Standard Specification for Road & Bridge Works, SECTION No. 1003)	Sqm	148245.94			
34	Providing, laying, spreading, watering, leveling and compaction of natural sand gravel sub base grading as specified and according to the designed camber all complete as per DoR-SSRBW SECTION No. 1201	Cum	35806.93			

Procument Item Details						
SL. No	Item Description	Unit	Quantity	Bidder's Rate (NPR)	Bidder's Rate (in words)	Total Amount (NPR)
35	Providing, laying, spreading, watering, leveling and compaction of crusher run materials (crushed stones) for base course according to the designed camber all complete as per DoR-SSRBW, Section 1202.	Cum	7045.73			
36	Providing and spraying bituminous prime coat MC30/MC70 including cleaning the road surface using wire brushes, broom etc before applying prime coat as per DoR-SSRBW, Section 13.01,1301 & 1302.	Ltr	47133.11			
37	Supply, load and spray Bitumen grade 80/100 binder for surface dressing all complete (1301, 1303)	Ltr	101807.52			
38	Providing of kerosene cutter for cutting back all complete (1301, 1303)	Ltr	11311.95			
39	Supply, Spread and compact 20mm and 10mm nominal size chips for double bituminous surface dressing (DBSD) as per specified spreading rates for each layer of surface dressing to meet all the requirements of special specification all complete.(1300)	Mt	1508.26			
40	Supplyand spray anti-stripping agent all complete (1301, 1303)	Kg	565.6			
41	Supplying and fixing in place R.C.C. delineater and guard post including excavation,paintng,and erectionetc. all complete as final drawing of DoLIDAR	Nos	2200.0			
42	Supplying and placing standard RCC kilometer post (place at each km) all complete including painting, and writing etc. all complete as per specification and drawings of DoLIDAR	Nos	25.0			
43	Supplying and placing standard RCC kilometer post (place at 5km interval) all complete including painting, and writing etc. all complete as per specification and drawings of DoLIDAR	Nos	7.0			
44	Supplying and erecting traffic sign in place including 50 mm dia steel tube, 2mm thick steel plate, cement concrete, painting, writing and supporting steel angle nut and bolt etc complete as per DoR-SSRBW SECTION No. 1501) : (a) 60 cm dia circular, 60 cm equilateral triangle and 60 x 45 cm rectangular shaped sign (Single post)	Nos	240.0			
45	Supplying and erecting traffic sign in place including 50 mm dia steel tube, 2mm thick steel plate, cement concrete, painting, writing and supporting steel angle nut and bolt etc complete as per DoR-SSRBW SECTION No. 1501) : (b) 1.2m x 0.75 m size bigger traffic sign with back support and two or more post	Nos	35.0			

Procument Item Details						
SL. No	Item Description	Unit	Quantity	Bidder's Rate (NPR)	Bidder's Rate (in words)	Total Amount (NPR)
46	Slope trimming work DoLIDAR : 4 Spec.Clause No.: 2-1.3.2,2-1.8 and 2-1.95	Sqm	1680.0			
47	Construction of Rip-rap drain with the stone pitching work of 20 cm thick and 1.2 m wide as per DoLIDAR-Tech. Spec. for LBCWARR Clause No. 8	Rm	420.0			
48	Dry stone check/toe walls for segmentation and support of slopes DoLIDAR Tech. Spec. clause No. 8	Cum	66.0			
49	Supply & construction of gabion check / toe wall for slope protection	Cum	37.5			
50	Brush layering work: including preparation of terraces of 30 - 40 cm wide and laying live cuttings of selected Species along the terrace @ 5 cm c/c with 2/3 of cuttings in to terrace and leaving one bud and up to 1/3 of the cuttings sticking beyond the terrace edge. (Cutting can be of assuro,simali etc of 45 - 60 m length) DoLIDAR Spec.Clause no.70-6.7 b	Rm	200.0			
51	Planting rooted grass slips on slopes < 45? including preparation of slips on site. Operation includes digging planting holes to a maximum of 5 cm depth with metal or hardwood peg, depending on nature of soil. The planting drills should be spaced 10 cm apart as per Bio engineering information of DOR	Sqm	1008.0			
52	Planting containerised tree and shrub seedlings, including pitting, transplanting, composting and placing tree guards, on toe of embankment slopes in plain areas, not less than 8 m from the road centre line. Pit size 30 cm diameter×30 cm depth. Compost volume ?? of the volume of pit, mixed with original soil as per Bio engineering information of DOR	Nos	30.0			
53	Supply of labour as required as per preamble and as instructed by the Engineer. : Unskilled labour	M/D	480.0			
54	Supply of labour as required as per preamble and as instructed by the Engineer. : Skilled labour	M/D	50.0			
55	Supply of excavator for maintenance of road or else as required and instructed by engineer including operator and other charges	Hrs	500.0			
56	Provide Built up Drawing as completed	LS	1.0			
Total of Procument Items						
Total Item Price						
VAT						
Grand Total						

Part III: CONDITIONS OF CONTRACT AND CONTRACT FORMS

SECTION-VIII

General Conditions of Contract

General Conditions of Contract

A. General	
1. Definitions	1.1 Boldface type is used to identify defined terms. (a) The **Accepted Contract Amount** means the amount accepted in the Letter of Acceptance for the execution and completion of the Works and the remedying of any defects. (b) The **Activity Schedule** is a schedule of the activities comprising the construction, installation, testing, and commissioning of the Works in a lump sum contract. It includes a lump sum price for each activity, which is used for valuations and for assessing the effects of Variations and Compensation Events. (c) The Adjudicator is the person appointed jointly by the Employer and the Contractor to resolve disputes in the first instance, as provided for in GCC 23.2 hereunder. (d) **Bill of Quantities** means the priced and completed Bill of Quantities forming part of the Bid. (e) **Compensation Events** are those defined in GCC 50 hereunder. (f) The **Completion Date** is the date of completion of the Works as certified by the Project Manager, in accordance with GCC 68.1. (g) The **Contract** is the Contract between the Employer and the Contractor to execute, complete, and maintain the Works. It consists of the documents listed in GCC 2.3 below. (h) The **Contractor** is the party whose Bid to carry out the Works has been accepted by the Employer. (i) The **Contractor's Bid** is the completed bidding document submitted by the Contractor to the Employer. (j) The **Contract Price** is the Accepted Contract Amount stated in the Letter of Acceptance and thereafter as adjusted in accordance with the Contract. (k) **Days** are calendar days; months are calendar-months. (l) **Dayworks** are varied work inputs subject to payment on a time basis for the Contractor's employees and Equipment, in addition to payments for associated Materials and Plant. (m) A **Defect** is any part of the Works not completed in accordance with the Contract. (n) The **Defects Liability Certificate** is the certificate issued by Project Manager upon correction of defects by the Contractor. (o) The **Defects Liability Period** is the period calculated from the Completion Date where the Contractor remains responsible for remedying defects. (p) **Drawings** include calculations and other information provided or approved by the Project Manager for the execution of the Contract. (q) The **Employer** is the party who employs the Contractor to carry out the Works, as **specified in the SCC**. (r) **Equipment** is the Contractor's machinery and vehicles brought

	temporarily to the Site to construct the Works. (s) **Force Majeure** means an exceptional event or circumstance: which is beyond a Party's control; which such Party could not reasonably have provided against before entering into the Contract; which, having arisen, such Party could not reasonably have avoided or overcome; and, which is not substantially attributable to the other Party. (t) The **Initial Contract Price** is the Contract Price listed in the Employer's Letter of Acceptance. (u) **In writing** or **written** means hand written, type written, printed or electronically made, and resulting in permanent record. (v) The **Intended Completion Date** is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is **specified in the SCC**. The Intended Completion Date may be revised only by the Project Manager by issuing an extension of time or an acceleration order. (w) **Letter of Acceptance** means the formal acceptance by the Employer of the Bid and denotes the formation of the contract at the date of acceptance. (x) **Materials** are all supplies, including consumables, used by the Contractor for incorporation in the Works. (y) **Party** means the Employer or the Contractor, as the context requires. (z) **SCC** means Special Conditions of Contract (aa) **Plant** is any integral part of the Works that shall have a mechanical, electrical, chemical, or biological function. (bb) The **Project Manager** is the person **named in the SCC** (or any other competent person appointed by the Employer and notified to the Contractor, to act in replacement of the Project Manager) who is responsible for supervising the execution of the Works and administering the Contract. (cc) **Retention Money** means the aggregate of all monies retained by the Employer pursuant to GCC 54.1. (dd) **Schedules** means the document(s) entitled schedules, completed by the Contractor and submitted with the Letter of Bids, as included in the Contract. Such document may include the Bill of Quantities, data, lists, and schedules of rates and/or prices. (ee) The **Site** is the area defined as such in the SCC (ff) **Site Investigation Reports** are those that were included in the bidding documents and are factual and interpretative reports about the surface and subsurface conditions at the Site. (gg) **Specification** means the Specification of the Works included in the Contract and any modification or addition made or approved by the Project Manager. (hh) The **Start Date** is given i**n the SCC**. It is the latest date when the Contractor shall commence execution of the Works. It does not necessarily coincide with any of the Site Possession Dates. (ii) A **Subcontractor** is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract, which

	includes work on the Site. (jj) **Temporary Works** are works designed, constructed, installed, and removed by the Contractor that are needed for construction or installation of the Works. (kk) A **Variation** is an instruction given by the Project Manager which varies the Works (ll) The **Works** are what the Contract requires the Contractor to construct, install, and turn over to the Employer, as **defined in the SCC**.
2. Interpretation	2.1 In interpreting these GCC, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Project Manager shall provide instructions clarifying queries about these GCC. 2.2 If sectional completion is **specified in the SCC**, references in the GCC to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion Date and Intended Completion Date for the whole of the Works). 2.3 The documents forming the Contract shall be interpreted in the following order of priority: (a) Contract Agreement, (b) Letter of Acceptance, (c) Letters of Technical Bid and Price Bid, (d) Special Conditions of Contract, (e) General Conditions of Contract, (f) Specifications, (g) Drawings, (h) Bill of Quantities (or Schedules of Prices for lump sum contracts), and (i) Any other document **listed in the SCC** as forming part of the Contract.
3. Language and Law	3.1 The language of the Contract and the law governing the Contract are **stated in the SCC**.
	3.2. Throughout the execution of the Contract, the Contractor shall comply with the import of goods and services prohibitions in the Employer's country when (a) by an act of compliance with a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations, the Borrower's Country prohibits any import of goods from, or any payments to, a particular country, person, or entity. Where the borrower's country prohibits payments to a particular firm or for particular goods by such an act of compliance, that firm may be excluded.

4. Contract Agreement	4.1 The Parties shall enter into a Contract Agreement within 15 days after the Contractor receives the Letter of Acceptance, unless the Special Conditions establish otherwise. The Contract Agreement shall be based upon the attached Contract forms in Section X.
5. Assignment	5.1 Neither Party shall assign the whole or any part of the Contract or any benefit or interest in or under the Contract. However, either Party (a) may assign the whole or any part with the prior agreement of the other Party, at the sole discretion of such other Party; and (b) may, as security in favor of a bank or financial institution, assign its right to any moneys due, or to become due, under the Contract.
6. Care and Supply of Documents	6.1 The Specification and Drawings shall be in the custody and care of the Employer. Unless otherwise stated in the Contract, one copy of the Contract and of each subsequent Drawing shall be supplied to the Contractor, who may make or request further copies at the cost of the Contractor.
	6.2 Each of the Contractor's Documents shall be in the custody and care of the Contractor, unless and until taken over by the Employer. Unless otherwise stated in the Contract, the Contractor shall supply to the Engineer six copies of each of the Contractor's Documents.
	6.3 The Contractor shall keep, on the Site, a copy of the Contract, publications named in the Specification, the Contractor's Documents (if any), the Drawings and Variations and other communications given under the Contract. The Employer's Personnel shall have the right of access to all these documents at all reasonable times. 6.4 If a Party becomes aware of an error or defect in a document which was prepared for use in executing the Works, the Party shall promptly give notice to the other Party of such error or defect.
7. Confidential Details	7.1 The Contractor's and the Employer's Personnel shall disclose all such confidential and other information as may be reasonably required in order to verify the Contractor's compliance with the Contract and allow its proper implementation.
	7.2 Each of them shall treat the details of the Contract as private and confidential, except to the extent necessary to carry out their respective obligations under the Contract or to comply with applicable Laws. Each of them shall not publish or disclose any particulars of the Works prepared by the other Party without the previous agreement of the other Party. However, the Contractor shall be permitted to disclose any publicly available information, or information otherwise required to establish his qualifications to compete for other projects.
	7.3 Notwithstanding the above, the Contractor may furnish to its Subcontractor(s) such documents, data and other information it receives from the Employer to the extent required for the Subcontractor(s) to perform its work under the Contract, in which event the Contractor shall obtain from such Subcontractor(s) an undertaking of confidentiality

	similar to that imposed on the Contractor under this Clause.
8. Compliance with Laws	8.1 The Contractor shall, in performing the Contract, comply with applicable Laws.
9. Joint and Several Liability	9.1 If the Contractor is a joint venture of two or more entities , all such entities shall be jointly and severally liable to the Employer for the fulfillment of the provisions of the Contract, and shall designate one of such persons to act as a leader with authority to bind the joint venture. The composition or the constitution of the joint venture shall not be altered without the prior consent of the Employer.
10. Project Manager's Decisions	10.1 Except where otherwise specifically stated, the Project Manager shall decide contractual matters between the Employer and the Contractor in the role representing the Employer.
11. Delegation	11.1 The Project Manager may delegate any of his duties and responsibilities to other people after notifying the Contractor, and may cancel any delegation after notifying the Contractor.
12. Communications	12.1 Communications between parties that are referred to in the Conditions shall be effective only when in writing. A notice shall be effective only when it is delivered.
13. Subcontracting	13.1 **For GoN Funded:** A list of approved Subcontractors including its value/works is included as Article 2 (k) of contract Agreement. Approval by the Employer for any of the Subcontractors shall not relieve the Contractor from any of its obligations, duties, or responsibilities under the contract. **For DP Funded :** The Contractor may subcontract with the approval of the Project Manager, but may not assign the Contract without the approval of the Employer in writing. Subcontracting shall not alter the Contractor's obligations. Bidders may propose subcontracting up to the percentage of total value of contracts as **specified in the SCC.** The Sub contractor shall meet the qualification requirement as specified in SCC.
14. Other Contractors	14.1 The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Employer between the dates given in the Schedule of Other Contractors, **as referred to in the SCC**. The Contractor shall also provide facilities and services for them as described in the Schedule. The Employer may modify the Schedule of Other Contractors, and shall notify the Contractor of any such modification
15 Personnel and Equipment	15.1 The Contractor shall employ the key personnel and use the equipment identified in its Bid to carry out the Works, or other personnel and equipment approved by the Project Manager. The Project Manager shall approve any proposed replacement of key personnel and equipment only if their relevant qualifications or characteristics are substantially equal to or better than those proposed in the Bid. 15.2 If the Project Manager asks the Contractor to remove a person who is a member of the Contractor's staff or work force, stating the reasons, the

	Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract. 15.3 If the Employer, Project Manager, or Contractor determines, that any employee of the Contractor be determined to have engaged in corrupt, fraudulent, collusive, coercive, or other prohibited practices during the execution of the Works, then that employee shall be removed in accordance with Clause 15.2 above.
16. Employer's and Contractor's Risk	16.1 The Employer carries the risks which this Contract states are Employer's risks, and the Contractor carries the risks which this Contract states are Contractor's risks.
17. Employer's Risks	17.1 From the Start Date until the Defects Liability Certificate has been issued, the following are Employer's risks: (a) The risk of personal injury, death, or loss of or damage to property (excluding the Works, Plant, Materials, and Equipment), which are due to (i) use or occupation of the Site by the Works or for the purpose of the Works, which is the unavoidable result of the Works or (ii) negligence, breach of statutory duty, or interference with any legal right by the Employer or by any person employed by or contracted to him except the Contractor. (b) The risk of damage to the Works, Plant, Materials, and Equipment to the extent that it is due to a fault of the Employer or in the Employer's design, or due to war or radioactive contamination directly affecting the country where the Works are to be executed. 17.2 From the Completion Date until the Defects Liability Certificate has been issued, the risk of loss of or damage to the Works, Plant, and Materials is an Employer's risk except loss or damage due to (a) a Defect which existed on the Completion Date, (b) an event occurring before the Completion Date, which was not itself an Employer's risk, or (c) the activities of the Contractor on the Site after the Completion Date.
18. Contractor's Risks	18.1 From the Starting Date until the Defects Liability Certificate has been issued, the risks of personal injury, death, and loss of or damage to property (including, without limitation, the Works, Plant, Materials, and Equipment) which are not Employer's risks are Contractor's risks.
19. Insurance	19.1 The Contractor shall provide insurance in the joint names of the Employer and the Contractor from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles **stated in the SCC** for the following events which are due to the Contractor's risks: (a) loss of or damage to the Works, Plant, and Materials; (b) loss of or damage to Equipment; (c) loss of or damage to property (except the Works, Plant, Materials,

	and Equipment) in connection with the Contract; and (d) Personal injury or death.
	19.2 Policies and certificates for insurance shall be delivered by the Contractor to the Project Manager for the Project Manager's approval before the Start Date. All such insurance shall provide for compensation to be payable in the proportions of Nepalese Rupees required to rectify the loss or damage incurred. 19.3 If the Contractor does not provide any of the policies and certificates required, the Employer may affect the insurance which the Contractor should have provided and recover the premiums the Employer has paid from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due. 19.4 Alterations to the terms of insurance shall not be made without the approval of the Project Manager. 19.5 Both parties shall comply with any conditions of the insurance policies.
20. Site Investigation Reports	20.1 The Contractor, in preparing the Bid, shall rely on any Site Investigation Reports referred to **in the SCC**, supplemented by any information available to the Contractor.
21. Contractor to Construct the Works	21.1 The Contractor shall construct and install the Works in accordance with the Specifications and Drawings.
22. The Works to Be Completed within intended Completion Date	22.1 The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the Program submitted by the Contractor, as updated with the approval of the Project Manager, and complete them within the intended Completion Date.
23. Design by contractor and Approval by the Project Manager	23.1 The contractor shall be responsible for the design of permanent works as **specified in SCC**. 23.2 Contractor shall be responsible for design of the Temporary Works. The Contractor shall submit Specifications and Drawings showing the proposed Temporary Works to the Project Manager, for his approval. 23.3 All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, shall be subject to prior approval by the Project Manager before their use. 23.4 The Project Manager's approval shall not alter the Contractor's responsibility for design of temporary works.
24. Safety, Security and Protection of the Environment	24.1 The Contractor shall, throughout the execution, and completion of the works and remedying of any defects therein: a. Have full regard for the safety of all persons entitled to be upon the site and keep the site (so as the same is under his control) and the works (so far as the same are not completed or occupied by the Employer) in an orderly state appropriate to the avoidance of danger

	to such persons. b. Provide and maintain at his own cost all lights, guards, fencing, warning signs and watching, when necessary or required by the Project Manager or by any duly constituted authority, for the protection of the Works of for the safety and convenience of the public or others. c. Take all reasonable steps to protect the environment on and off the site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation. d. Ensure that any cut or fill slopes are planted in grass or other plant cover as soon as possible to protect them from erosion. e. Any spoil or material removed from drains shall be disposed of to designated stable tipping areas as directed by the Project Manager. f. Shall not use fuel wood as a means of heating during the processing or preparation of any materials forming part of the works. g. The Project Manager shall have the power to disallow any working practice or activity of the Contractor or direct that such practices or activities be modified should the Project Manager consider, on the advice of the relevant Government Departments, that the practices or activities will be harmful to wildlife. h. Provide on the Site such lifesaving apparatus as may be appropriate and an adequate and easily accessible first aid outfit or such outfits as may be required by any government ordinance, factory act, etc., subsequently published and amended from time to time.
25. Discoveries	25.1 Anything of historical or other interest or of significant value unexpectedly discovered on the Site shall be the property of the employer. The Contractor shall notify the Project Manager of such discoveries and carry out the Project Manager's instructions for dealing with them.
26. Possession of the Site	26.1 The Employer shall give possession of all parts of the Site to the Contractor. If possession of a part is not given by the date **stated in the SCC**, the Employer shall be deemed to have delayed the start of the relevant activities, and this shall be a Compensation Event.
27. Access to the Site	27.1 The Contractor shall allow the Project Manager and any person authorized by the Project Manager access to the Site and to any place where work in connection with the Contract is being carried out or is intended to be carried out.
28. Instructions, Inspections and Audits	28.1 The Contractor shall carry out all instructions of the Project Manager which comply with the applicable laws where the Site is located. 28.2 The Contractor shall keep, and shall make all reasonable efforts to cause its Subcontractors and sub consultants to keep accurate and systematic accounts and records in respect of the Works in such form

	and details as will clearly identify relevant time changes and costs. 28.3 The Contractor shall permit the GoN/DP and/or persons appointed by the GoN/DP to inspect the Site and/or the accounts and records of the Contractor and its sub-contractors relating to the performance of the Contract, and to have such accounts and records audited by auditors appointed by the GoN/DP if required by the GoN/DP. The Contractor's attention is drawn to Sub-Clause 73.2 which provides, inter alia, that acts intended to materially impede the exercise of the GoN's/DP's inspection and audit rights provided for under this Sub-Clause constitute a obstructive practice subject to contract termination.
29. Dispute Settlement	29.1 The Employer and the Contractor shall attempt to settle amicably by direct negotiation any disagreement or dispute arising between them under or in connection with the Contract. 29.2 Any dispute between the Parties as to matters arising pursuant to this Contract which cannot be settled amicably within thirty (30) days after receipt by one Party of the other Party's request for such amicable settlement may be referred to Arbitration within 30 days after the expiration of amicable settlement period.
30. Procedures for Disputes	30.1 In case of arbitration, the arbitration shall be conducted in accordance with the arbitration procedures published by the Nepal Council of Arbitration (NEPCA) at the place **given in the SCC**.
B. Staff and Labor	
31. Forced Labor	31.1 The Contractor shall not employ forced labor, which consists of any work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty. This covers any kind of involuntary or compulsory labor, such as indentured labor, bonded labor, or similar labor–contracting arrangements.
32. Child Labor	32.1 The Contractor shall not employ children in a manner that is economically exploitative, or is likely to be hazardous, or to interfere with, the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development. Where national laws have provisions for employment of minors, the Contractor shall follow those laws applicable to the Contractor. Children below the age of 18 years shall not be employed in dangerous work.
33. Non-discrimination and Equal Opportunity	34.1 The Contractor shall not make employment decisions on the basis of personal characteristics unrelated to inherent job requirements. The Contractor shall base the employment relationship on the principle of equal opportunity and fair treatment, and shall not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline. In countries where national law provides for non-discrimination in employment, the Contractor shall comply with national law. When national laws are silent on nondiscrimination in employment, the Contractor shall meet this Sub clause's requirements. Special measures of protection or assistance to remedy past discrimination or

	selection for a particular job based on the inherent requirements of the job shall not be deemed discrimination.
B. Time Control	
34. Program	34.1 Within the time **stated in the SCC**, after the date of the Letter of Acceptance, the Contractor shall submit to the Project Manager for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works. In the case of a lump sum contract, the activities in the Program shall be consistent with those in the Activity Schedule. 34.2 An update of the Program shall be a program showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work, including any changes to the sequence of the activities. 34.3 The Contractor shall submit to the Project Manager for approval an updated Program at intervals no longer than the period **stated in the SCC**. If the Contractor does not submit an updated Program within this period, the Project Manager may withhold the amount stated in the SCC from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program has been submitted. In the case of a lump sum contract, the Contractor shall Provide an updated Activity Schedule within 15 days of being instructed to by the Project Manager. 34.4 The Project Manager's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Project Manager again at any time. A revised Program shall show the effect of Variations and Compensation Events.
35. Extension of the Intended Completion Date	35.1 The Project Manager shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining work, which would cause the Contractor to incur additional cost. 35.2 The Project Manager shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Project Manager for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information at least 7 days prior to the intended completion date. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.
36. Acceleration	36.1 When the Employer wants the Contractor to finish before the Intended Completion Date, the Project Manager shall obtain priced proposals for achieving the necessary acceleration from the Contractor. If the Employer accepts these proposals, the Intended Completion Date shall be adjusted accordingly and confirmed by both the Employer and the Contractor. 36.2 If the Contractor's priced proposals for acceleration are accepted by the Employer, they are incorporated in the Contract Price and treated as a Variation.

37. Delays Ordered by the Project Manager	37.1 The Project Manager may instruct the Contractor to delay the start or progress of any activity within the Works.
38. Management Meetings	38.1 Either the Project Manager or the Contractor may require the other to attend a management meeting. The business of a management meeting shall be to review the plans for remaining work and to deal with matters raised in accordance with the early warning procedure. 38.2 The Project Manager shall record the business of management meetings and provide copies of the record to those attending the meeting and to the Employer. The responsibility of the parties for actions to be taken shall be decided by the Project Manager either at the management meeting or after the management meeting and stated in writing to all who attended the meeting.
39. Early Warning	39.1 The Contractor shall warn the Project Manager at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price, or delay the execution of the Works. The Project Manager may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate shall be provided by the Contractor as soon as reasonably possible. 39.2 The Contractor shall cooperate with the Project Manager in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Project Manager.
C. Quality Control	
40. Identifying Defects	40.1 The Project Manager shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Project Manager may instruct the Contractor to search for a Defect and to uncover and test any work that the Project Manager considers may have a Defect.
41. Tests	41.1 If the Project Manager instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no Defect, the test shall be a Compensation Event.
42. Correction of Defects	42.1 The Project Manager shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion, and is **defined in the SCC**. The Defects Liability Period shall be extended for as long as Defects remain to be corrected. 42.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Project Manager's notice.
43. Uncorrected Defects	43.1 If the Contractor has not corrected a Defect within the time specified in the Project Manager's notice, the Project Manager shall assess the cost of having the Defect corrected, and the Contractor shall pay this amount.

D. Cost Control	
44. Contract Price	44.1 In the case of a Unit Rate contract, the Bill of Quantities shall contain priced items for the Works to be performed by the Contractor. The Bill of Quantities is used to calculate the Contract Price. The Contractor will be paid for the quantity of the work accomplished at the rate in the Bill of Quantities for each item. 44.2 In the case of a lump sum contract, the Activity Schedule shall contain the priced activities for the Works to be performed by the Contractor. The Activity Schedule is used to monitor and control the performance of activities on which basis the Contractor will be paid. If payment for Materials on Site shall be made separately, the Contractor shall show delivery of Materials to the Site separately on the Activity Schedule.
45. Changes in the Contract Price	45.1 In the case of an Unit Rate contract: (a) If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25 percent, provided the change exceeds 2 percent of the Initial Contract Price, the Project Manager shall adjust the rate to allow for the change. (b) The Project Manager shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 10 percent, except with the prior approval of the Employer. (c) If requested by the Project Manager, the Contractor shall provide the Project Manager with a detailed cost breakdown of any rate in the Bill of Quantities. 45.2 In the case of a lump sum contract, the Activity Schedule shall be amended by the Contractor to accommodate changes of Program or method of working made at the Contractor's own discretion. Prices in the Activity Schedule shall not be altered when the Contractor makes such changes to the Activity Schedule.
46. Variations	46.1 All Variations shall be included in updated Programs, and, in the case of a lump sum contract, also in the Activity Schedule, produced by the Contractor.
	46.2 The Contractor shall provide the Project Manager with a quotation for carrying out the Variation when requested to do so by the Project Manager. The Project Manager shall assess the quotation, which shall be given within seven (7) days of the request or within any longer period stated by the Project Manager and before the Variation is ordered. 46.3 If the Contractor's quotation is unreasonable, the Project Manager may order the Variation and make a change to the Contract Price, which shall be based on the Project Manager's own forecast of the effects of the Variation on the Contractor's costs. 46.4 If the Project Manager decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event. 46.5 The Contractor shall not be entitled to additional payment for costs that

	could have been avoided by giving early warning. 46.6 In the case of an Unit Rate contract, if the work in the Variation corresponds to an item description in the Bill of Quantities and if, in the opinion of the Project Manager, the quantity of work above the limit stated in **GCC 45.1** or the timing of its execution do not cause the cost per unit of quantity to change, the rate in the Bill of Quantities shall be used to calculate the value of the Variation. If the cost per unit of quantity changes, or if the nature or timing of the work in the Variation does not correspond with items in the Bill of Quantities, the quotation by the Contractor shall be in the form of new rates for the relevant items of work.
47. Cash Flow Forecasts	47.1 When the Program, or, in the case of a lump sum contract, the Activity Schedule, is updated, the Contractor shall provide the Project Manager with an updated cash flow forecast.
48. Payment Certificates	48.1 The Contractor shall submit to the Project Manager monthly statements of the estimated value of the work executed less the cumulative amount certified previously. 48.2 The Project Manager shall check the Contractor's monthly statement and certify the amount to be paid to the Contractor within 30 days of submission by contractor. 48.3 The value of work executed shall be determined by the Project Manager. 48.4 The value of work executed shall comprise: (a) In the case of an Unit Rate contract, the value of the quantities of work in the Bill of Quantities that have been completed; or (b) In the case of a lump sum contract, the value of work executed shall comprise the value of completed activities in the Activity Schedule. 48.5 The value of work executed shall include the valuation of Variations and Compensation Events. 48.6 The Project Manager may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.
49. Payments	49.1 Payments shall be adjusted for deductions for advance payments and retention. The Employer shall pay the Contractor the amounts certified by the Project Manager within 30 days of the date of each certificate. If the Employer makes a late payment, the Contractor shall be paid interest as **indicated in the SCC** on the late payment in the next payment. Interest shall be calculated from the date by which the payment should have been made up to the date when the late payment is made. 49.2 If an amount certified is increased in a later certificate or as a result of an award by an Arbitrator, the Contractor shall be paid interest upon the delayed payment as set out in this clause. Interest shall be calculated from the date upon which the increased amount would have been certified in the absence of dispute. 49.3 Items of the Works for which no rate or price has been entered in BOQ

	shall not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.
50. Compensation Events	50.1 The following shall be Compensation Events: (a) The Employer does not give access to a part of the Site by the Site Possession Date pursuant to GCC 26.1. (b) The Employer modifies the Schedule of Other Contractors in a way that affects the work of the Contractor under the Contract. (c) The Project Manager orders a delay or does not issue Drawings, Specifications, or instructions required for execution of the Works on time. (d) The Project Manager instructs the Contractor to uncover or to carry out additional tests upon work, which is then found to have no Defects. (e) The Project Manager unreasonably does not approve a subcontract to be let. (f) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of the Letter of Acceptance from the information issued to bidders (including the Site Investigation Reports), from information available publicly and from a visual inspection of the Site. (g) The Project Manager gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons. (h) Other contractors, public authorities, utilities, or the Employer does not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Contractor. (i) The advance payment is delayed. (j) The effects on the Contractor of any of the Employer's Risks. (k) The Project Manager unreasonably delays issuing a Certificate of Completion. 50.2 If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the Contract Price shall be increased and/or the Intended Completion Date shall be extended. The Project Manager shall decide whether and by how much the Contract Price shall be increased and whether and by how much the Intended Completion Date shall be extended. 50.3 As soon as information demonstrating effect of each Compensation Event upon the Contr tor's forecast cost has been provided by the Contractor, it shall be assessed by the Project Manager, and the Contract Price shall be adjusted accordingly. If the Contractor's forecast is deemed unreasonable, the Project Manager shall adjust the Contract Price based on the Project Manager's own forecast. The Project Manager shall assume that the Contractor shall react competently and promptly to the event. 50.4 The Contractor shall not be entitled to compensation to the extent that the Employer's interests are adversely affected

	by the Contractor's not having given early warning or not having cooperated with the Project Manager.
51. Tax	51.1 The Project Manager shall adjust the Contract Price if taxes, duties, and other levies are changed between the date 30 days before the submission of bids for the Contract and the date of the last Completion certificate. The adjustment shall be the change in the amount of tax payable by the Contractor, provided such changes are not already reflected in the Contract Price or are a result of GCC 53.
52. Currency	52.1 The currency of Contracts shall be Nepalese Rupees.
53. Price Adjustment	53.1 Prices shall be adjusted for fluctuations in the cost of inputs only if provided for **in the SCC**. If so provided, the amounts certified in each payment certificate, before deducting for Advance Payment, shall be adjusted by applying the respective price adjustment factor to the payment amounts due. 53.2 Adjustment Formulae[8]: The formulae will be of the following general type: $$pn = A + b\frac{Ln}{Lo} + c\frac{Mn}{Mo} + d\frac{En}{Eo} + etc.$$ Where: *pn* is a price adjustment factor to be applied to the amount for the payment of the work carried out in the subject month, determined in accordance with Clause 49; *A* is a constant, specified in the Bidding Forms- Table of Price Adjustment data, representing the nonadjustable portion in contractual payments;[9]b, c, d, etc., coefficients representing the estimated proportion of each cost element (labor, materials, equipment usage, etc.) in the Works or sections thereof, net of Provisional Sums, **as specified in the SCC;** *Ln, Mn, En,* etc., are the current cost indices or reference prices of the cost elements for month "n," determined pursuant to Sub-Clause 53.4, applicable to each cost element; and *Lo, Mo, Eo,* etc., are the base cost indices or reference prices corresponding to the above cost elements at the date specified in Sub-Clause 53.4
	53.3 Sources of Indices and Weightings: The sources of indices shall be those listed in the Bidding Forms- Table of Price Adjustment data, as approved by the Project Manager and stated in SCC. Indices shall be appropriate for their purpose and shall relate to the Contractor's proposed source of supply of inputs on the basis of which his Contract

[8] For complex Works involving several types of construction work with different inputs, a family of Formulae will be necessary. The various items of Day work may also require different formulae, depending on the nature and source of the inputs

[9] Insert a figure for factor A only where there is a part of the Contractors' expenditures which will not be subject to fluctuation in cost or to compensate for the unreliability of some indices. A should normally be 0.15. The sum of A, b, c, d, etc., should be one.

	shall have been computed. As the proposed basis for price adjustment, the Contractor shall have submitted with his bid the tabulation of Weightings and Source of Indices in the Bidding Forms, which shall be subject to approval by the Project Manager. 53.4 Base, Current and Provisional Indices: The base cost indices or prices shall be those prevailing on the day 30 days prior to the latest date for submission of bids. Current indices or prices shall be those prevailing on the day 30 days prior to the last day of the period to which a particular Interim Payment Certificate is related. If at any time the current indices are not available, provisional indices as determined by the Project Manager will be used, subject to subsequent correction of the amounts paid to the Contractor when the current indices become available. 53.5 Weightings: The weightings for each of the factors of cost given in the Bidding Forms shall be adjusted if, in the opinion of the Project Manager, they have been rendered unreasonable, unbalanced or inapplicable as a result of varied or additional work already executed or instructed under Clause 46 or for any other reason.
	53.6 Where, price adjustment provision is not applicable pursuant to Sub-clause 53.1 then the Contract is subject to price adjustment only for construction material in accordance with this clause. If the prices of the construction materials stated in the contract is increased or decreased in an unexpected manner in excess of ten (10%) percent in comparison to the base price construction material stated in Section –IV, Bidding Forms-Table of Price Adjustment Data, then the price adjustment for the increase or decrease of price of the construction material beyond 10% shall be made by applying the following formulas: For unexpected increase in price $P = [R_1 - (R_0 \times 1.10)] \times Q$ For unexpected decrease in price P $= [R_1 - (R_0 \times 0.90)] \times Q$ Where: "P" is price adjustment amount "R_1" is the present price of the construction material (Source of indices shall be those listed in the Bidding forms) "R_0" is the base price of the construction material "Q" is quantity of the construction material consumed in construction during the period of price adjustment consideration If the Base price and source is to be proposed by the Bidder as per the provision made in Section –IV, Bidding Forms-Table of Price Adjustment Data then the Base price and source filled by Bidder for the construction material stated in the Bidding Form shall be subject to the approval of the Project manager and shall be as **stated in SCC**..

	53.7 The Price Adjustment amount shall be limited to a maximum of the initial Contract Amount **as specified in the SCC**. 53.8 The Price Adjustment provision shall not be applicable for delayed period if the contract is not completed in time due to the delay caused by the contractor or the contract is a Lump sum Contract
54. Retention	54.1 The Employer shall retain from each payment due to theContractor the proportion stated in the SCC until Completion of the whole of the Works. 54.2 Upon the issue of a Defects Liability Certificate by the Project Manager, **in accordance with GCC** 70.1, half the total amount retained shall be repaid to the Contractor and half when the Contractor has submitted the evidence of submission of tax return to the concerned Internal Revenue Office. On completion of the whole works, the Contractor may substitute retention money with an "on demand" bank guarantee.
55. Liquidated Damages	55.1 The Contractor shall pay liquidated damages to the Employer at the rate per day **stated in the SCC** for each day that the Completion Date is later than the Intended Completion Date. The total amount of liquidated damages shall not exceed the amount **defined in the SCC**. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor's liabilities. 55.2 If the Intended Completion Date is extended after liquidated damages have been paid, the Project Manager shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate. The Contractor shall be paid interest on the overpayment, calculated from the date of payment to the date of repayment, at the rates specified in GCC.49
56. Bonus	56.1 The Contractor shall be paid a Bonus calculated at the rate per calendar day **stated in the SCC** for each day (less any days for which the Contractor is paid for acceleration) that the Completion is earlier than the Intended Completion Date. The Project Manager shall certify that the Works are complete, although they may not be due to be complete.
57. Advance Payment	57.1 The Employer shall make advance payment to the Contractor of the amounts stated in the SCC in two equal installments by the date **stated in the SCC**, against provision by the Contractor of an unconditional bank guarantee from 'A' class commercial Bank in a form acceptable to the Employer in amounts equal to the advance payment. The guarantee shall remain effective until the advance payment has been repaid, but the amount of the guarantee shall be progressively reduced by the amounts repaid by the Contractor. Interest shall not be charged on the advance payment.
	57.2 The Contractor is to use the advance payment only to pay for Equipment, Plant, Materials, and mobilization expenses required

	specifically for execution of the Contract. The Contractor shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents to the Project Manager. 57.3 The advance payment shall be repaid by deducting proportionate amounts, **as stated in SCC**, from payments otherwise due Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuations of work done, Variations, price adjustments, Compensation Events, Bonuses, or Liquidated Damages.
58. Securities	58.1 The Performance Security, including any additional security required as per ITB 35.5 and ITB 40.1, shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount **specified in the SCC,** by a 'A' class commercial bank acceptable to the Employer, and denominated in Nepalese Rupees. The Performance Security shall be valid until a date 30 days from the date of issue of the Defect Liability Certificate in the case of a bank guarantee. Any additional performance security required as per ITB 35.5 shall be valid until a date 30 days from the date of issue of the certificate of Completion in the case of a bank guarantee. Any additional performance security required as per ITB 40.1 shall be valid until a date 30 days from the date of issue of the certificate of DLP in the case of a bank guarantee. 58.2 The performance security issued by any foreign Bank outside Nepal must be counter guaranteed by an "A" class commercial Bank in Nepal.
59. Day works	59.1 If applicable, the Day works rates in the Contractor's Bid shall be used for small additional amounts of work only when the Project Manager has given written instructions in advance for additional work to be paid for in that way. 59.2 All work to be paid for as Day works shall be recorded by the Contractor on forms approved by the Project Manager. Each completed form shall be verified and signed by the Project Manager within two days of the work being done. 59.3 The Contractor shall be paid for Day works subject to obtaining signed Day works forms.
60. Cost of Repairs	60.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.
F. Force Majeure	
61. Definition of Force Majeure	61.1 In this Clause, "Force Majeure" means an exceptional event or circumstance, (a) which is beyond a Party's control;

	(b) which such Party could not reasonably have provided against before entering into the Contract; (c) which, having arisen, such Party could not reasonably have avoided or overcome; and (d) which is not substantially attributable to the other Party.
	61.2 Force Majeure may include, but is not limited to, exceptional events or circumstances of the kind listed below, so long as conditions (a) to (d) above are satisfied: (a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies; (b) rebellion, terrorism, sabotage by persons other than the Contractor's Personnel, revolution, insurrection, military or usurped power, or civil war; (c) riot, commotion, disorder, strike or lockout by persons other than the Contractor's Personnel; (d) munitions of war, explosive materials, ionizing radiation or contamination by radio-activity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity; and (e) natural catastrophes such as earthquake, hurricane, typhoon or volcanic activity.
62. Notice of Force Majeure	62.1 If a Party is or will be prevented from performing its substantial obligations under the Contract by Force Majeure, then it shall give notice to the other Party of the event or circumstances constituting the Force Majeure and shall specify the obligations, the performance of which is or will be prevented. The notice shall be given within 14 days after the Party became aware, or should have become aware, of the relevant event or circumstance constituting Force Majeure.
	62.2 The Party shall, having given notice, be excused performance of its obligations for so long as such Force Majeure prevents it from performing them.
	62.3 Notwithstanding any other provision of this Clause, Force Majeure shall not apply to obligations of either Party to make payments to the other Party under the Contract.
63. Duty to Minimize Delay	63.1 Each Party shall at all times use all reasonable endeavors to minimize any delay in the performance of the Contract as a result of Force Majeure.
	63.2 A Party shall give notice to the other Party when it ceases to be affected by the Force Majeure.

64. Consequences of Force Majeure	64.1 If the Contractor is prevented from performing its substantial obligations under the Contract by Force Majeure of which notice has been given under GCC 62, and suffers delay and/or incurs Cost by reason of such Force Majeure, the Contractor shall be entitled subject to GCC 30 to (a) an extension of time for any such delay, if completion is or will be delayed, under GCC35 ; and (b) if the event or circumstance is of the kind described in sub-paragraphs (a) to (d) of GCC 61.2 and, in the case of subparagraphs (b) to (d), occurs in the Country, payment of any such Cost, including the costs of rectifying or replacing the Works and/or Goods damaged or destructed by Force Majeure, to the extent they are not indemnified through the insurance policy referred to in GCC 19.
	64.2 After receiving this notice, the Project Manager shall proceed in accordance with GCC 10 to agree or determine these matters.
65. Force Majeure Affecting Subcontractor	65.1 If any Subcontractor is entitled under any contract or agreement relating to the Works to relief from force majeure on terms additional to or broader than those specified in this Clause, such additional or broader force majeure events or circumstances shall not excuse the Contractor's nonperformance or entitle him to relief under this Clause.
66. Optional Termination, Payment and Release	66.1 If the execution of substantially all the Works in progress is prevented for a continuous period of 90 days by reason of Force Majeure of which notice has been given under GCC 62, or for multiple periods which total more than 150 days due to the same notified Force Majeure, then either Party may give to the other Party a notice of termination of the Contract. In this event, the termination shall take effect 7 days after the notice is given, and the Contractor shall proceed in accordance with GCC 72.5.
	66.2 Upon such termination, the Project Manager shall determine the value of the work done and issue a Payment Certificate, which shall include (a) the amounts payable for any work carried out for which a price is stated in the Contract; (b) the Cost of Plant and Materials ordered for the Works which have been delivered to the Contractor, or of which the Contractor is liable to accept delivery: this Plant and Materials shall become the property of (and be at the risk of) the Employer when paid for by the Employer, and the Contractor shall place the same at the Employer's disposal; (c) other Costs or liabilities which in the circumstances were reasonably and necessarily incurred by the Contractor in the expectation of completing the Works;

	(d) the Cost of removal of Temporary Works and Contractor's Equipment from the Site and the return of these items to the Contractor's works in his country (or to any other destination at no greater cost); and (e) the Cost of repatriation of the Contractor's staff and labor employed wholly in connection with the Works at the date of termination.
67. Release from Performance	67.1 Notwithstanding any other provision of this Clause, if any event or circumstance outside the control of the Parties (including, but not limited to, Force Majeure) arises, which makes it impossible or unlawful for either or both Parties to fulfill its or their contractual obligations or which, under the law governing the Contract, entitles the Parties to be released from further performance of the Contract, then upon notice by either Party to the other Party of such event or circumstance, (a) the Parties shall be discharged from further performance, without prejudice to the rights of either Party in respect of any previous breach of the Contract; and (b) the sum payable by the Employer to the Contractor shall be the same as would have been payable under GCC 66 if the Contract had been terminated under GCC 66.
G. Finishing the Contract	
68. Completion	68.1 The Contractor shall request the Project Manager to issue a certificate of Completion of the Works, and the Project Manager shall do so upon deciding that the work is completed.
69. Taking Over	69.1 The Employer shall take over the Site and the Works within seven days of the Project Manager's issuing a certificate of Completion.
70. Final Account	70.1 The Contractor shall supply the Project Manager with a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Project Manager shall issue a Defects Liability Certificate and certify any final payment that is due to the Contractor within 60 days of receiving the Contractor's account if it is correct and complete. If it is not, the Project Manager shall issue within 60 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Project Manager shall decide on the amount payable to the Contractor and issue a payment certificate.
71. Operating and Maintenance Manuals	71.1 If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the **dates stated in the SCC**. 71.2 If the Contractor does not supply the Drawings and/or manuals by the dates **stated in the SCC** pursuant to **GCC 71.1,** or they do not receive the Project Manager's approval, the Project Manager shall withhold the amount **stated in the SCC** from payments due to the Contractor.

72. Termination	72.1 The Employer may terminate the Contract at any time if the contractor; a. does not commence the work as per the Contract, b. abandons the work without completing, c. fails to achieve progress as per the Contract. 72.2 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract. 72.3 Fundamental breaches of Contract shall include, but shall not be limited to, the following : (a) The Contractor uses the advance payment for matters other than the contractual obligations, (b) the Contractor stops work for 30 days when no stoppage of work is shown on the current Program and the stoppage has not been authorized by the Project Manager; (c) the Project Manager instructs the Contractor to delay the progress of the Works, and the instruction is not withdrawn within 30 days; (d) the Employer or the Contractor is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation. (e) a payment certified by the Project Manager is not paid by the Employer to the Contractor within 90 days of the date of the Project Manager's certificate; (f) the Project Manager gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Project Manager; (g) the Project Manager gives two consecutive Notices to update the Program and accelerate the works to ensure compliance with GCC Sub clause 22.1 and the Contractor fails to update the Program and demonstrate acceleration of the works within a reasonable period of time determined by the Project Manager; (h) the Contractor does not maintain a Security, which is required; (i) the Contractor has delayed the completion of the Works by the number of days for which the maximum amount of liquidated damages can be paid, **as defined in the SCC**; and (j) If the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in executing the Contract, pursuant to GCC 73.1. 72.4 When either party to the Contract gives notice of a breach of Contract to the Project Manager for a cause other than those listed under GCC 72.3 above, the Project Manager shall decide whether the breach is fundamental or not. 72.5 Notwithstanding the above, the Employer may terminate the Contract

	for convenience. 72.6 If the Contract is terminated, the Contractor shall stop work immediately, make the Site safe and secure, and leave the Site as soon as reasonably possible.
73. Fraud and Corruption	73.1 If the Employer determines that the Contractor has engaged in corrupt, fraudulent, collusive, coercive or obstructive practices, in competing for or in executing the Contract, then the Employer may, after giving 15 daysnotice to the Contractor, terminate the Contractor's employment under the Contract and expel him from the Site. 73.2 Should any employee of the Contractor be determined to have engaged in corrupt, fraudulent, collusive, coercive, or obstructive practice during the execution of the Works, then that employee shall be removed in accordance with GCC Clause 15. For the purposes of this GCC 73; (i) "corrupt practice" is the offering, giving, receiving or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party. (ii) "fraudulent practice"[5] is any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation; (iii) "collusive practice"[6] is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party; (iv) "coercive practice"[7] is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party; (v) "obstructive practice" is (aa) deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede a investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; and/or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or (bb) acts intended to materially impede the exercise of the GON's/DP's inspection and audit rights provided for under GCC28.3.
74. Black Listing	74.1 Without prejudice to any other rights of the Employer under this Contract, GoN, Public Procurement Monitoring Office (PPMO), on the recommendation of procuring entity, may blacklist a Bidder for its conduct for a period of one (1) to three (3) years on the following grounds and seriousness of the act committed by the bidder: (a) if it is established that the Contractor has committed

	substantial defect in implementation of the contract or has not substantially fulfilled its obligations under the contract or the completed work is not of the specified quality as per the contract. (b) If convicted from a court of law in a criminal offense liable to be disqualified for taking part in procurement contract, (c) If it is established that the Contractor has engaged in corrupt or fraudulent practices in competing for or in executing the Contract.
75. Payment upon Termination	75.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Project Manager shall issue a certificate for the value of the work done and Materials ordered less advance payments received up to the date of the issue of the certificate. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be a debt payable to the Employer. 75.2 If the Contract is terminated for the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Project Manager shall issue a certificate for the value of the work done, Materials ordered, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works, and less advance payments received up to the date of the certificate.
	75.3 If the Contract is terminated because of fundamental breach of Contract or for any other fault by the Contractor, the performance security shall be forfeited by the Employer. In such case, amount to complete the remaining works as per the Contract shall be recovered from the Contractor as Government dues.
76. Property	76.1 All Materials on the Site, Plant, Equipment, Temporary Works, and Works shall be deemed to be the property of the Employer if the Contract is terminated because of the Contractor's default.
77. Release from Performance	77.1 If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of either the Employer or the Contractor, the Project Manager shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which a commitment was made.
78. Suspension of DP Loan/Credit/Grant	78.1 In the event that the DP suspends the loan/ credit/grant to the Employer from which part of the payments to the Contractor are being made: a. the Employer is obligated to notify the Contractor of such suspension within 7 days of having received the DP's suspension notice; and b. if the Contractor has not received sums due him within the 30 days for payment provided for in GCC 49.1, the Contractor may immediately issue a 15-day termination notice.
79. Eligibility	79.1 The Contractor shall have the nationality of an eligible country as

	specified in Section V of the bidding document. The Contractor shall be deemed to have the nationality of a country if the Contractor is a citizen or is constituted, or incorporated, and operates in conformity with the provisions of the laws of that country. This criterion shall also apply to the determination of the nationality of proposed subcontractors or suppliers for any part of the Contract including related services.
	79.2 The materials, equipment, and services to be supplied under the Contract shall have their origin in eligible source countries as specified in Section V of the bidding document and all expenditures under the Contract will be limited to such materials, equipment, and services. At the Employer's request, the Contractor may be required to provide evidence of the origin of materials, equipment, and services.
	79.3 For purposes of GCC 79.2, "origin" means the place where the materials and equipment are mined, grown, produced, or manufactured, and from which the services are provided. Materials and equipment are produced when, through manufacturing, processing, or substantial or major assembling of components, a commercially recognized product results that differs substantially in its basic characteristics or in purpose or utility from its components.
80. Project Manager's Duties and Authorities	80.1 The Project Manager's duties and authorities are restricted to the extent as **stated in the SCC**.
81. Quarries and Spoil Dumps	81.1 Any quarry operated as part of this Contract shall be maintained and left in a stable condition without steep slopes and be either refilled or drained and be landscaped by appropriate planting. Rock or gravel taken from a river shall be removed over some distance so as to limit the depth of material removed at any one location, not disrupt the river flow or damage or undermine the river banks. The Contractor shall not deposit excavated material on land in Government or private ownership except as directed by the Project Manager in writing or by permission in writing of the authority responsible for such land in Government ownership, or of the owner or responsible representative of the owner of such land in private ownership, and only then in those places and under such conditions as the authority, owner or responsible representative may prescribe.
82. Local Taxation	82.1 The prices bid by the Contractor shall include all taxes that may be levied in accordance to the laws and regulations in being in Nepal on the date 30 days prior to the closing date for submissions of Bids on the Contractor's equipment, plant and materials acquired for the purpose of the Contract and on the services performed under the Contract. Nothing in the Contract shall relieve the Contractor from his responsibility to pay any tax that may be levied in Nepal on profits made by him in respect of the Contract.
83. Value Added Tax	83.1 The Contract is not exempted from value added tax. An amount specified in the schedule of taxes shall be paid by the Contractor in the concerned VAT office within time frame specified in VAT regulation.
84. Income Taxes	84.1 The Contractor's staff, personnel and labor will be liable to pay

on Staff	personal income taxes in Nepal in respect of their salaries and wages, as are chargeable under the laws and regulations for the time being in force, and the Contractor shall perform such duties in regard to such deductions as may be imposed on him by such laws and regulations. 84.2 The issue of the Final Account Certificate pursuant to clause GCC 70 shall be made only upon submittal by the Contractor of a certificate of income tax clearance from the Government of Nepal.
85. Duties, Taxes and Royalties	85.1 Any element of royalty, duty or tax in the price of any goods including fuel oil, and lubricating oil, cement, timber, iron and iron goods locally procured by the Contractor for the works shall be included in the Contract rates and prices and no reimbursement or payment in that respect shall be made to the Contractor. 85.2 The Contractor shall familiarize himself with GON the rules and regulations with regard to customs, duties, taxes, clearing of goods and equipment, immigration and the like, and it will be necessary for him to follow the required procedures regardless of the assistance as may be provided by the Employer wherever possible. 85.3 The Contractor shall pay and shall not be entitled to the reimbursement of cost of extracting construction materials such as sand, stone/boulder, gravel, etc. from the river beds or quarries. Such prices will be levied by the local District Development Committee (DDC) as may be in force at the time. The Contractor, sub-contractor(s) employed directly by him and for whom he is responsible, will not be exempted from payment of royalties, taxes or other kinds of surcharges on these construction materials so extracted and paid for to the DDC.
86. Member of Government, etc, not Personally Liable	86.1 No member or officer of GoN or the Employer or the Project Manager or any of their respective employees shall be in any way personally bound or liable for the act or obligations of the Employer under the Contract or answerable for any default or omission in the observance or performance of any of act, matter or thing which are herein contained.
87. Approval of Use of Explosives	87.1 No explosives of any kind shall be used by the Contractor without the prior consent of the Employer in writing and the Contractor shall provide, store and handle these and all other items of every kind whatsoever required for blasting operations, all at his own expense in a manner approved in writing by the Employer.
88 Compliance with Regulations for Explosives	88.1 The Contractor shall comply with all relevant ordinances, instructions and regulations which the Government, or other person or persons having due authority, may issue from time to time regarding the handling, transportation, storage and use of explosives.
89. Permission for Blasting	89.1 The Contractor shall at all times maintain full liaison with and inform well in advance, and obtain such permission as is required from all Government authorities, public bodies and private parties whatsoever concerned or affected, or likely to be concerned or affected by blasting operation.
90. Records of	90.1 Before the beginning of the Defects Liability Period, the Contractor shall

Explosives	account to the satisfaction of the Project Manager for all explosives brought on to the Site during the execution of the Contract and the Contractor shall remove all unused explosives from the Site on completion of works when ordered by the Project Manager.
91. Traffic Diversion	91.1 The Contractor shall include the necessary safety procedures regarding and pedestrian traffic diversion that is needed in execution of the works. The Contractor shall include in his costing of works, any temporary works or diversion that are needed during the construction period. All traffic diversion should be designed for the safety of both the motoring public and the men at work. It shall ensure the uninterrupted flow of traffic and minimum inconvenience to the public during the period concerned. As such, adequate warning signs, flagmen and other relevant safety precautionary measures shall be provided to warn motorists and pedestrians well ahead of the intended diversion as directed by the Project Manager. All traffic devices used shall be designed in accordance with the instruction of Project Manager.

SECTION-IX

Special Conditions of Contract

The following Special Conditions of Contract (SCC) shall supplement the General Conditions of Contract (GCC). Whenever there is a conflict, the provisions herein shall prevail over those in the GCC.

A. General	
GCC 1.1 (q)	The Employer is District Level Project Implementation Unit (DLPIU/GMaLI), Makwanpur
GCC 1.1 (v)	The Intended Completion Date for the whole of the Works shall be 18 months from the start date with the following Milestones: Milestone 1; Physical works 15 % of Contract price completed within first 6 months from date of start of works. Milestone 2; Physical works 50 % of Contract price completed within 12 months from date of start of works. Milestone 3; Completion of whole Works within 18 Months from date of start of works. Sectional completion is not applicable
GCCs 1.1 (bb) & 10.1	The Project Manager is DLPIU/GMaLI Chief
GCC 1.1 (ee)	The Site is located at Bhimphedi Rural Municipality from Chainage 0+000 to 23+640 km and is defined in drawings No. 1
GCC 1.1 (hh)	The Start Date shall be 17-10-2018
GCC 1.1 (ll)	The Works consist of Earthwork, Subgrade, Sub base, Stone Masonry Retaining/ Breast walls, Gabion Retaining/ Breast walls, Side drain, Pipe culverts, Slab culverts, RCC causeway, DBST, Boi-engineering Works etc.
GCC 2.2	Sectional Completions are: NA
GCC 2.3 (i)	The following documents also form part of the Contract: i) IEE Reports and EMP ii) Minutes of Pre Bid Meeting iii) Any Addendum Issued iv) Minutes of management meetings
GCC 3.1	The language of the contract is ENGLISH/NEPALI The law that applies to the Contract is the law of NEPAL
GCC 11.1	The Project Manager may delegate any of his duties and responsibilities
GCC 13.1	Maximum percentage of subcontracting permitted is: 0 % of the total contract amount Nature of Works that can be sub contracted: Not Applicable Qualification Criteria: Not Applicable

GCC 14.1	Schedule of other contractors: NA
GCC 19.1	The minimum insurance amounts and deductibles shall be: 1. The minimum cover for loss of or damage to the Works, Plant and Materials is: 110% of the Contract Amount. 2. The maximum deductible for insurance of the Works and of Plant and Materials is: NRs. 200000 3. The minimum cover for loss or damage to Equipment is : Full Replacement 4. The maximum deductible for insurance of Equipment is: NRs. 200000 5. The minimum for insurance of other property is: NRs. 100000 with unlimited number of occurrences 6. The maximum deductible for insurance of other property is: NRs. 200000 7. The minimum cover for personal injury or death insurance i. for the Contractor's employees is that specified in the Labor act of Nepal and ii. for other people is : NRs. 700000 with an unlimited number of occurrences
GCC 20.1	Site Investigation Reports are: NA
GCC 23.1	The following shall be designed by the Contractor: NA
GCC 26.1	The Site Possession Date(s) shall be: 7 Days after signing contract.
GCC 30.1	The place of arbitration shall be: Kathmandu
B. Time Control	
GCC 34.1	The Contractor shall submit for approval a Program for the Works within 15days from the date of the Letter of Acceptance.
GCC 34.3	The period between Program updates is 30 days The amount to be withheld for late submission of an updated Program is 300000 NPR
C. Quality Control	
GCC 42.1	The Defects Liability Period is 365 Days
D. Cost Control	
GCC 49.1	Prevailing Interest Rate 0% %

GCC 53.1

The Contract is subject to price adjustment.
The following information regarding coefficients does apply.

The coefficients and indices for adjustment of prices in Nepalese Rupees shall be as specified in the Table of Adjustment Data submitted by bidder together with the Letter of Bid which is approved by the Project manager.

Sl No.	Index Description	Source of Index	Base Value	Base Date	Employer's Proposed Weighting coefficient Range from	Employer's Proposed Weighting coefficient Range to
1	Non-Adjustable(A)				0.15	0.15
2	Labor (b)	District Rate ,FY 2074/75	590	Bid Submission date - 30 days	0.15	0.20
3	Materials (c)	National Wholesale Price Index" - Construction Materials" of Nepal Rastra Bank	0	Bid Submission date - 30 days	0.5	0.6
4	Equipment usage (d)	"Fuel" Price fixed by Nepal Oil Corporation	0	Bid Submission date - 30 days	0.2	0.25

GCC 53.6

Base Price of Construction Materials applicable for price adjustment shall be as per the Table of Adjustment Data submitted by Bidder together with the Letter of Price Bid which is approved by the Project manager.

GCC 53.7

The Price Adjustment amount shall be limited to a maximum 10 % of the initial Contract Amount

GCC 54.1

The proportion of payments retained is: 5 %

GCC 55.1

The liquidated damages for the whole of the Works are 0.05 % of the final Contract Price per day. The maximum amount of liquidated damages for the whole of the Works is 10 % of the final Contract Price.

GCC 55.1 added

The liquidated damages for the whole of the Works are 0.05PERCENT of the final Contract Price per day. and that for the Milestones are as under;

Milestone 1: 0.005% of Contract Price per day.

Milestone 2: 0.025% of Contract Price per day.

Milestone 3: 0.05% of Contract Price per day.

Liquidated damage for Milestone 1 will be levied until end of Milestone 2, and then only liquidated damage of Milestone 2 will be levied until end of Milestone 3, and so on. No Two liquidated damage will be applicable at one time.

The contractor will be paid after deducting liquidated damages amount from Interim Payment Certificate. The liquidated damages amount of first and second milestones will be returned to contractor at the end of intended completion period if whole work is completed within intended completion time.

The maximum amount of liquidated damages for the whole Works is Ten (10) percent of Contract price.

GCC 56.1	The Bonus for the whole of the Works is 0 % per day. The maximum amount of Bonus for the whole of the Works is 0 % of the Contract Price.
GCC 57.1	The Advance Payments shall be 20.00 % and shall be paid in two equal installments to the Contractor.

Installment	Percentage	Requirement
First installment	10.0	of initial contract price excluding provisional sums, day works and shall be paid to the contractor upon submission of acceptable Bank Guarantee for advance Payment from issued from a commercial bank.
Second installment	10.0	shall be made after the fully mobilization at site and start construction activities ,(Submission of insurance policies,final construction survey report, Establishment of Labor camp)

GCC 57.3	Deductions from Payment Certificates will commence in the first certificate in which the value of works executed exceeds 30% of the Contract Price. Deduction will be at the rate of 40% of the respective Monthly Interim Payment Certificate until such time as the advance payment has been repaid; provided that the advance payment shall be completely repaid prior to the end of 80% of the approved contract period.
GCC 58.1	The Performance Security amount is 5% of the bid price, i) If bid price of the bidder selected for acceptance is up to 15 (fifteen) percent below the approved cost estimate. ii) For the bid price of the bidder selected for acceptance is more than 15 (fifteen) percent below of the cost estimate, the performance security amount shall be determined as follows: Performance Security Amount =[(0.85 x Cost Estimate – Bid Price) x 0.5] + 5% of Bid Price. The Bid Price and Cost Estimate shall be inclusive of Value Added Tax The Performance Security, including any additional security required as per ITB 35.5 and ITB 40.1, shall be provided to the Employer no later than the date specified in the Letter of Acceptance.

E. Finishing the Contract

GCC 71.1	The date by which operating and maintenance manuals are required is NA
GCC 71.2	The date by which 'as built' drawings are required is 60 The amount to be withheld for failing to produce "as built" drawings and/or Operating and maintenance manuals is
GCC 72.3 (i)	The maximum number of days is 200 days
GCC 80	The Project Manager has to obtain the specific approval of the Employer for taking any of the following actions : a. Approving subcontracting of any part of the works under General Conditions of Contract Clause 7; b. Certifying additional costs determined under General Conditions of Contract Clause 42; c. Determining start date under General Conditions of Contract Clause 1; d. Determining the extension of the intended Completion Date under General Conditions of Contract Clause 27; e. Issuing a Variation under General Conditions of Contract Clause 1 and 38, except in an emergency situation, as reasonably determined by the Project Manager; emergency situation may be defined as the situation when protective measures must be taken for the safety of life or of the works or of adjoining property.

f. Adjustment of rates under General Conditions of Contract Clause 37;

SECTION-X

Contract Forms

This Section contains forms which, once completed, will form part of the Contract. The forms for Performance Security and Advance Payment Security, when required, shall only be completed by the successful Bidder after contract award.

Section X: Contract Forms

This Section contains forms which, once completed, will form part of the Contract. The forms for Performance Security and Advance Payment Security, when required, shall only be completed by the successful Bidder after contract award.

Letter of Intent
[on letterhead paper of the Employer]

Date: ... ……

To: .....***Name and address of the Contractor***.....

Subject: …… Issuance of letter of intent to award the contract.....

This is to notify you that, it is our intention to award the contract ... .***[insert date]*** .....for execution of the ...…..***[insert name of the contract and identification number, as given in the Contract Data/SCC]*** to you as your bid price ..... ***[insert amount in figures and words in Nepalese Rupees]*** as corrected and modified in accordance with the Instructions to Bidders is hereby selected as substantially responsive lowest evaluated bid.

Authorized Signature: ……

Name: ... …….

Title: …….

CC:
[Insert name and address of all other Bidders, who submitted the bid]

[Notes on Letter of Intent
The issuance of Letter of Intent is the information of the selection of the bid of the successful bidder by the Employer and for providing information to other unsuccessful bidders who participated in the bid as regards to the outcome of the procurement process. This standard form of Letter of Intent to Award should be filled in and sent to the successful Bidder only after evaluation and selection of substantially responsible lowest evaluated bid.]

Letter of Acceptance
[on letterhead paper of the Employer]

Date: ……..

To: ……***Name and address of the Contractor***……...

Subject: ……*Notification of Award*

This is to notify that your Bid dated .....***date*** ……..f tion of the…….***name of the contract and identification number, as given in the Contract Data/SCC*** ……... for the Contract price of Nepalese Rupees ***[insert amount in figures and words in Nepalese Rupees],*** as corrected in accordance with the Instructions to Bidders is hereby accepted in accordance with the Instruction to Bidders.

You are hereby instructed to contact this office to sign the formal contract agreement within 15 days with Performance Security of **NRs**. ……. in accordance with the Conditions of Contract, using for that purpose the Performance security Form included in Section X (Contract Forms) of this Bidding Document.

Authorized Signature: ……...

Name and Title of Signatory: ……

Contract Agreement

THIS AGREEMENT made the .....day of…..between……. name of the Employer ***……(hereinafter "the Employer"),*** of the one part, and ……name of the Contractor ……(hereinafter "the Contractor"), of the other part:

WHEREAS the Employer desires that the Works known as …….... name of the Contract .....should be executed by the Contractor, and has accepted a Bid by the Contractor for the execution and completion of these Works and the remedying of any defects in the sum of NRs ***…….[i t amount of contract price in words and figures including taxes]***(hereinafter "the Contract Price").

The Employer and the Contractor agree as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Contract documents referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement. This Agreement shall prevail over all other Contract documents.
   (a) the Letter of Acceptance;
   (b) the Letters of Technical and Price Bid;
   (c) the Addenda Nos ..... **Insert addenda numbers if any** ……
   (d) the Special Conditions of Contract;
   (e) the List of Eligible Countries that was specified in Section V of the bidding document,
   (f) the General Conditions of Contract;
   (g) the Specification;
   (h) the Drawings;
   (i) Bill of Quantities (or Schedules of Prices for lump sum contracts), and
   (j) Table of Price Adjustment Data
   (k) List of Approved Subcontractors *[For GoN funded project]*
   (l).....**[Specify if there are any other document]**

3. In consideration of the payments to be made by the Employer to the Contractor as indicated in this Agreement, the Contractor hereby covenants with the Employer to execute the Works and to remedy defects therein in conformity in all respects with the provisions of the Contract.

4. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of Nepal on the day, month and year indicated above.

Signed by …….
for and on behalf the Contractor in the presence of

Witness, Name Signature, Address, Date

Signed by……..
for and on behalf of the Employer in the presence of

Witness, Name, Signature, Address, Date

List of Approved Subcontractors

In accordance with GCC Sub-Clause 13.1,The following Subcontractors are approved for carrying out the work as specified below.

Name of Subcontractors	Description of Works	Value/Percentage of subcontract

Performance Security

(On letterhead paper of the 'A' class commercial Bank)

..... ***Bank's Name, and Address of Issuing Branch or Office*** ..... Beneficiary: ..... Name and Address of Employer …….....

Date: .....

Performance Guarantee No.:…….

We have been informed that ..... ***[insert name of the Contractor]*** (hereinafter called "the Contractor") has been notified by you to sign the Contract No. …….. ***[insert reference number of the Contract]*** for the execution of …….. ***[insert name of contract and brief description of Works]*** (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

At the request of the Contractor, we... ..... ***[insert name of the Bank]*** hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of .....***[insert name of the currency and amount in figures*] (... .. insert amount in words)*** such sum being payable in Nepalese Rupees, upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation(s) under the Contract, without your needing to prove or to show grounds for your demand or the sum specified therein.

This guarantee shall expire, no later than the……..Day of …… **, and any demand for payment under it must be received by us at this office on or before that date.

……

Seal of Bank and Signature(s)

Note:

All italicized text is for guidance on how to prepare this demand guarantee and shall be deleted from the final document.

* The Guarantor shall insert an amount representing the percentage of the Contract Price specified in the Contract in Nepalese Rupees.

** Insert the date thirty days after the date specified for the Defect Liability Period. The Employer should note that in the event of an extension of the time for completion of the Contract, the Employer would need to request an extension of this guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the Employer might consider adding the following text to the form, at the end of the penultimate paragraph: "The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed [six months], in response to the Employer's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee".

Advance Payment Security

(On letterhead paper of the 'A' class commercial Bank)

…….. Bank's Name, and Address of Issuing Branch or Office.....

Beneficiary: ……***Name and address of employer***

Date : ……

Advance Payment Guarantee No……..

We have been informed that ……has entered into Contract No. ..... ***Name and Address of Employer***……***name of the Contractor***……(hereinafter called "the Contractor")..reference number of the Contract……dated …… with you, for the execution of ...contract and brief description of Works ……. (hereinafter called "the Contract").

Furthermore, we understand that, according to the Conditions of the Contract, an advance payment in the sum……. name of the currency and amount in figures****…(.... amount in words .....)*** is to be made against an advance payment guarantee.

At the request of the Contractor, we..…..…. ***name of the Bank*** ……. hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of……name of the currency and amount in figures****... .....…(…… amount in words ……..……)*** upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation under the Contract because the Contractor used the advance payment for purposes other than the costs of mobilization in respect of the Works.

The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Contractor as indicated in copies of interim statements or payment certificates which shall be presented to us. This guarantee shall expire, at the latest, upon our receipt of a copy of the interim payment certificate indicating that eighty (80) percent of the Contract Price has been certified for payment, or on the ..... day of .....**, whichever is earlier. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

……

Seal of Bank and Signature(s)

Note:

All italicized text is for guidance on how to prepare this demand guarantee and shall be deleted from the final document.

*The Guarantor shall insert an amount representing the amount of the advance payment in Nepalese Rupees of the advance payment as specified in the Contract.

** Insert the date Thirty days after the expected completion date. The Employer should note that in the event of an extension of the time for completion of the Contract, the Employer would need to request an extension of this guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the Employer might consider adding the following text to the form, at the end of the penultimate paragraph: "The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed [six months], in response to the Employer's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee".