

**ISLAMIC REPUBLIC OF PAKISTAN  
NATIONAL HIGHWAY AUTHORITY**



**Asian Development Bank**

**Loan 4416-PAK:**

**Central Asia Regional Economic Cooperation  
(CAREC) Corridor Development Investment  
Program [Tranche-III]**

**National Highway Authority Component  
(OCB/CAREC/T-III)**

**STANDARD BIDDING DOCUMENT**

**PROCUREMENT OF  
WORKS**

**- Single-Stage: Two-Envelope Bidding Procedure -**

For projects governed by Procurement Regulations for ADB  
Borrowers: Goods, Works, Nonconsulting and Consulting  
Services (2017)

**Asian Development Bank  
October 2022**



# PROCUREMENT OF WORKS

## Bidding Document for Procurement of

### OCB/CAREC/T-III:

**Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 KM) from Two-Lane to Four-Lane Under one Package Comprising of Four Lots**

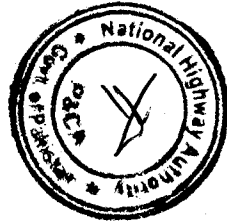
- *Lot-1: Rajanpur – Jampur Section (57.50 Km)*
- *Lot-2: Jampur – DG Khan Section (64.0 Km)*
- *Lot-3: DG Khan to Tibi Qaisrani via Shahdan Lund Section (111.70 Km)*
- *Lot-4: Tibi Qaisrani to DI Khan via Ramak Section (96.245Km)*

**Issued on:** 9<sup>th</sup> August 2024  
**Invitation for Bids No.:** OCB/CAREC/T-III  
**OCB No.:** OCB/CAREC/T-III  
**Employer:** National Highway Authority  
**Country:** Pakistan



# Preface

This Bidding Document for the Procurement of Works has been prepared by **National Highway Authority** and is based on the Standard Bidding Document for the Procurement of Works (SBD Works) issued by the Asian Development Bank dated **[October 2022]**.



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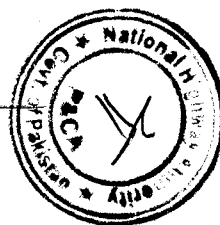
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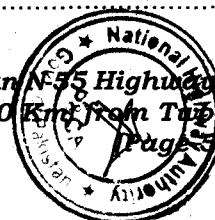


# Section 1: Instructions to Bidders

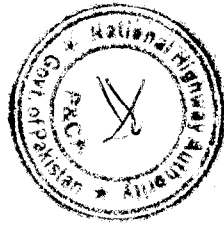
This section specifies the procedures to be followed by Bidders in the preparation and submission of their Bids. Information is also provided on the submission, opening, evaluation of bids, and award of contract.

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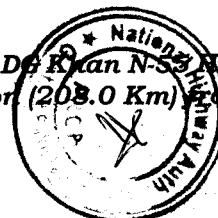


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## A. General

<p><b>1. Scope of Bid</b></p>	<p>1.1 In connection with the Invitation for Bids (IFB) 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 6 (<b>Works'</b> Requirements). The name, identification, and number of contracts of the open competitive bidding (OCB) are provided in the BDS.</p>
	<p>1.2 Throughout this Bidding Document,</p> <p>(a) the term "in writing" means communicated in written form and delivered against receipt;</p> <p>(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</p> <p>(c) "day" means calendar day.</p>
<p><b>2. Source of Funds</b></p>	<p>2.1 The Borrower or Recipient (hereinafter called "Borrower") indicated in the BDS has applied for or received financing (hereinafter called "funds") from the Asian Development Bank (hereinafter called "ADB") toward the cost of the project named in the BDS. The Borrower intends to apply a portion of the funds to eligible payments under the contract(s) for which this Bidding Document is issued.</p>
	<p>2.2 Payments by the ADB will be made only at the request of the Borrower and upon approval by ADB in accordance with the terms and conditions of the Financing Agreement between the Borrower and ADB (hereinafter called "Financing Agreement"), and will be subject in all respects to the terms and conditions of that Financing Agreement. No party other than the Borrower shall derive any rights from the Financing Agreement or have any claim to the funds.</p>
<p><b>3. Fraud and Corruption</b></p>	<p>3.1 ADB requires Borrowers (including beneficiaries of ADB-financed activity) and their personnel, as well as firms and individuals participating in an ADB-financed activity, including but not limited to, Bidders, Suppliers, and Contractors, agents, subcontractors, subconsultants, service providers, subsuppliers, manufacturers (including their respective officers, directors, employees and personnel) under ADB-financed contracts to observe the highest standard of ethics during the procurement and execution of such contracts in accordance with ADB's Anticorruption Policy (1998, as amended from time to time). In pursuance of this policy, ADB</p> <p>(a) defines, for the purposes of this provision, the terms set forth below as follows:</p> <p>(i) "corrupt practice" means the offering, giving, receiving, or soliciting, directly or indirectly, anything of value to influence improperly the actions of another party;</p> <p>(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;</p> <p>(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;</p>



	<p>(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;</p> <p>(v) "abuse" means theft, waste, or improper use of assets related to ADB-related activity, either committed intentionally or through reckless disregard;</p> <p>(vi) "conflict of interest" means any situation in which a party has interests that could improperly influence that party's performance of official duties or responsibilities, contractual obligations, or compliance with applicable laws and regulations; and</p> <p>(vii) "integrity violation" means any act, as defined under ADB's Integrity Principles and Guidelines (2015, as amended from time to time), which violates ADB's Anticorruption Policy, including (i) to (vi) above and the following: obstructive practice, violations of ADB sanctions, retaliation against whistleblowers or witnesses, and other violations of ADB's Anticorruption Policy, including failure to adhere to the highest ethical standards.</p> <p>(b) will reject a proposal for award if it determines that the Bidder recommended for award or any of its officers, directors, employees, personnel, subconsultants, subcontractors, service providers, suppliers or manufacturers has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations in competing for the Contract;</p> <p>(c) will cancel the portion of the financing allocated to a contract if it determines at any time that representatives of the Borrower or of a beneficiary of ADB financing engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations during the procurement or the execution of that contract, without the Borrower having taken timely and appropriate action satisfactory to ADB to remedy the situation, including by failing to inform ADB in a timely manner at the time they knew of the integrity violations;</p> <p>(d) will impose remedial actions on a firm or an individual, at any time, in accordance with ADB's Anticorruption Policy and Integrity Principles and Guidelines, including declaring ineligible, either indefinitely or for a stated period of time, to participate<sup>1</sup> in ADB-financed, -administered, or -supported activities or to benefit from an ADB-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</p> <p>(e) will have the right to require that a provision be included in bidding documents and in contracts financed, administered, or supported by ADB, requiring Bidders, suppliers and contractors, consultants, manufacturers, service providers and other third parties engaged or involved in ADB-related activities, and their respective officers, directors, employees and personnel, to permit ADB or its representative to inspect the site and their assets, accounts and records and other documents relating to the bid submission and</p>
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<sup>1</sup> Whether as a Contractor, Subcontractor, Consultant, Manufacturer or Supplier, or Service Provider; or in any other capacity (different names are used depending on the particular Bidding Document).

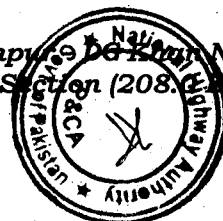




	<p>contract performance and to have them audited by auditors appointed by ADB.</p>
	<p>3.2 All Bidders, consultants, contractors, suppliers, manufacturers, service providers, and other third parties engaged or involved in ADB-related activities, and their respective officers, directors, employees and personnel, are required to cooperate fully in any investigation when requested by ADB to do so. As determined on a case-by-case basis by ADB, such cooperation is set out in detail in the Integrity Principles and Guidelines.</p> <p>3.3 All Bidders, consultants, contractors and suppliers shall require their officers, directors, employees, personnel, agents to ensure that, in its contracts with its subconsultants, Subcontractors, and other third parties engaged or involved in ADB-related activities, such subconsultants, Subcontractors, and other third parties similarly are required to cooperate fully in any investigation when requested by ADB to do so.</p> <p>3.4 The Employer hereby puts the Bidder on notice that the Bidder or any Joint Venture partner of the Bidder (if any) may not be able to receive any payments under the Contract if the Bidder or any of its Joint-Venture partners, as appropriate, is, or is owned (in whole or in part) by a person or entity subject to applicable sanctions.</p> <p>3.5 Furthermore, Bidders shall be aware of the provision stated in Sub-Clause 1.17 and Part C [Corrupt and Fraudulent Practices] of the Particular Conditions of Contract.</p>
<b>4. Eligible Bidders</b>	<p>4.1 A Bidder may be a natural person, private entity, or government-owned enterprise subject to ITB 4.5—or any combination of them with a formal intent to enter into an agreement or under an existing agreement in the form of a Joint Venture. In the case of a Joint Venture,</p> <p>(a) all partners shall be jointly and severally liable; and</p> <p>(b) the Joint Venture 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 Joint Venture during the bidding process and, in the event the Joint Venture is awarded the Contract, during contract execution.</p>
	<p>4.2 A Bidder, and all parties constituting the Bidder, shall have the nationality of an eligible country, in accordance with Section 5 (Eligible Countries). A Bidder shall be deemed to have the nationality of a country if the Bidder is a citizen or is constituted, incorporated, or registered, 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.</p>
	<p>4.3 A Bidder shall not have a conflict of interest. All Bidders 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 the bidding process if any of, including but not limited to, the following apply:</p> <p>(a) they have controlling shareholders in common; or</p> <p>(b) they receive or have received any direct or indirect subsidy from any of them; or</p> <p>(c) they have the same legal representative for purposes of this bid; or</p>



	<p>(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</p> <p>(e) a Bidder participates in more than one bid in this bidding process, either individually or as a partner in a Joint Venture, except for alternative offers permitted under ITB 13 of the Bidding Document. 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 a Bidder as a Subcontractor in another Bid or of a firm as a Subcontractor in more than one Bid; or</p> <p>(f) a Bidder, Joint Venture partner, associates, parent company, or any 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</p> <p>(g) a Bidder was affiliated with a firm or entity that has been hired (or is proposed to be hired) by the Employer or Borrower as Engineer for the contract; or</p> <p>(h) a Bidder would be providing goods, works, or nonconsulting services resulting from or directly related to consulting services for the preparation or implementation of the project specified in the BDS ITB 2.1 that it provided or were provided by any affiliate that directly or indirectly controls, is controlled by, or is under common control with that firm; or</p> <p>(i) A Bidder that has a financial or familial relationship with Employer's personnel including personnel of project implementing/executing agency, or of a recipient of a part of the loan who: (i) are directly or indirectly involved in the preparation of the bidding documents or specifications of the contract, and/or the bid evaluation process of such contract; or (ii) would be involved in the implementation or supervision of such contract unless the conflict stemming from such relationship has been resolved in a manner acceptable to ADB throughout the procurement process and execution of the contract.</p>
	<p>4.4 A firm will not be eligible to participate in any procurement activities under an ADB-financed, -administered, or -supported project while under temporary suspension or debarment by ADB pursuant to its Anticorruption Policy (see ITB 3), whether such debarment was directly imposed by ADB, or enforced by ADB pursuant to the Agreement for Mutual Enforcement of Debarment Decisions. A bid from a temporarily suspended or debarred firm will be rejected and such bid may be in breach of debarment conditions, thereby subject to further ADB's investigation.</p>
	<p>4.5 Government-owned enterprises in the Employer's country shall be eligible only if they can establish that they (i) are legally and financially autonomous, (ii) operate under commercial law, and (iii) are not a dependent agency of the Employer.</p>
	<p>4.6 A Bidder shall not be under suspension from bidding by the Employer as the result of the execution of a Bid-Securing Declaration.</p> <p>4.7 Bidders shall provide such evidence of their continued eligibility satisfactory to the Employer, as the Employer shall reasonably request.</p>



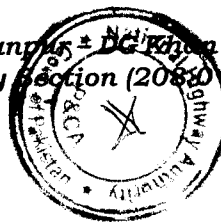
	<p>4.8 Bidders shall be excluded if, by an act of compliance with a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations, the Borrower's country prohibits any import of goods from, or payments to, a particular country, person or entity in respect of goods or services originating in that country. Where the Borrower's country prohibits payments to a particular person or entity or for particular goods or services by such an act of compliance, that firm shall be excluded.</p> <p>4.9 In case a prequalification process has been conducted prior to the bidding process, this bidding is open only to prequalified Bidders.</p>
<b>5. Eligible Materials, Equipment and Services</b>	<p>5.1 The materials, equipment, and services to be supplied under the Contract shall have their origin in eligible source countries as defined in ITB 4.2, 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.</p>
	<p>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.</p>
<b>B. Contents of Bidding Document</b>	
<b>6. Sections of Bidding Document</b>	<p>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.</p> <p><b>PART I Bidding Procedures</b></p> <p>Section 1 - Instructions to Bidders (ITB)</p> <p>Section 2 - Bid Data Sheet (BDS)</p> <p>Section 3 - Evaluation and Qualification Criteria (EQC)</p> <p>Section 4 - Bidding Forms (BDF)</p> <p>Section 5 - Eligible Countries (ELC)</p> <p><b>PART II Requirements</b></p> <p>Section 6 - Works' Requirements (WRQ)</p> <p><b>PART III Conditions of Contract and Contract Forms</b></p> <p>Section 7 - General Conditions of Contract (GCC)</p> <p>Section 8 - Particular Conditions of Contract (PCC)</p> <p>Section 9 - Contract Forms (COF)</p>
	<p>6.2 The IFB issued by the Employer is not part of the Bidding Document.</p>
	<p>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 IFB.</p>



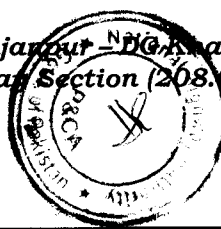
	6.4 The Bidder is expected to examine all instructions, forms, terms, and specifications in the Bidding Document. Failure to furnish all information or documentation required by the Bidding Document may result in the rejection of the bid.
<b>7. Clarification of Bidding Document, Site Visit, Pre-Bid Meeting</b>	7.1 A prospective Bidder requiring any clarification on the Bidding Document shall contact the Employer in writing at the Employer's address indicated in the BDS or raise his inquiries 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 no later than 21 days prior to the deadline for submission of bids. 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 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 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 not later than 1 week before the meeting.
	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 Nonattendance at the pre-bid meeting will not be a cause for disqualification of a Bidder.



<b>8. Amendment of Bidding Document</b>	8.1 At any time prior to the deadline for submission of Bids, the Employer may amend the Bidding Document by issuing addenda.
	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
<b>C. Preparation of Bids</b>	
<b>9. Cost of Bidding</b>	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.
<b>10. Language of Bid</b>	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.
<b>11. Documents Comprising the Bid</b>	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: <ul style="list-style-type: none"> <li>(a) Letter of Technical Bid;</li> <li>(b) Bid Security or Bid-Securing Declaration, in accordance with ITB 19;</li> <li>(c) alternative Bids, if permissible, in accordance with ITB 13;</li> <li>(d) written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 20.2;</li> <li>(e) documentary evidence in accordance with ITB 17, establishing the Bidder's qualifications to perform the contract;</li> <li>(f) Technical Proposal in accordance with ITB 16; and</li> <li>(g) any other document required in the BDS.</li> </ul>
	11.3 The Price Bid shall comprise the following: <ul style="list-style-type: none"> <li>(a) Letter of Price Bid;</li> <li>(b) completed Price Schedules, in accordance with ITB 12 and ITB 14;</li> <li>(c) alternative price Bids, at Bidder's option and if permissible, in accordance with ITB 13; and</li> <li>(d) any other document required in the BDS.</li> </ul>
	11.4 In addition to the requirements under ITB 11.2, 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.
<b>12. Letters of Bid and Schedules</b>	12.1 The Letters of Technical Bid and Price Bid, and the Schedules, including the Bill of Quantities, shall be prepared using the relevant forms furnished in Section 4 (Bidding Forms). 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 and as required in the BDS.
<b>13. Alternative Bids</b>	13.1 Unless otherwise indicated 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 Except as provided under 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 6 (Works' Requirements). The method for their evaluation will be stipulated in Section 3 (Evaluation and Qualification Criteria).
<b>14. Bid Prices and Discounts</b>	14.1 The prices and discounts quoted by the Bidder in the Letter of Price Bid and in the Bill of Quantities shall conform to the requirements specified below.
	14.2 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. Unit rates and prices for all items of the Works described in the Bill of Quantities shall be expressed in positive values. If unit rates and prices are expressed in negative values, the bid will be rejected.
	14.3 The price to be quoted in the Letter of Price Bid, in accordance with ITB 12.1, shall be the total price of the Bid, excluding any discounts offered. Absence of the total bid price in the Letter of Price Bid may result in the 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 The prices shall be either fixed or adjustable as specified in the BDS.  (a) In the case of Fixed Price, prices quoted by the Bidder shall be fixed during the Bidder's performance of the contract and not subject to



	<p>variation on any account. A Bid submitted with an adjustable price will be treated as nonresponsive and rejected.</p> <p>(b) In the case of Adjustable Price, prices quoted by the Bidder shall be subject to adjustment during performance of the contract to reflect changes in the cost elements such as labor, material, transport, and contractor's equipment in accordance with the provisions of the Conditions of Contract. A Bid submitted with a fixed price will be treated as nonresponsive and be rejected. The Bidder shall furnish the indexes and weightings for the price adjustment formulas in the Tables of Adjustment Data included in Section 4 (Bidding Forms) and the Employer may require the Bidder to justify its proposed indexes and weightings. Any bid that omits indexes and weightings shall be subject to clarification with the Bidder.</p>
	<p>14.6 If so indicated in ITB 1.1, bids are being 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.</p>
	<p>14.7 All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, as of the date 28 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.</p>
<b>15. Currencies of Bid and Payment</b>	<p>15.1 The unit rates and the prices shall be quoted by the Bidder entirely in the currency specified in the BDS.</p>
	<p>15.2 Bidders shall indicate the portion of the bid price that corresponds to expenditures incurred in the currency of the Employer's country in the Schedule of Payment Currencies included in Section 4 (Bidding Forms).</p>
	<p>15.3 Bidders expecting to incur expenditures in other currencies for inputs to the Works supplied from outside the Employer's country and wishing to be paid accordingly may indicate the other currencies in the Schedule of Payment Currencies included in Section 4 (Bidding Forms).</p>
	<p>15.4 The rates of exchange to be used by the Bidder for currency conversion during bid preparation shall be the selling rates for similar transactions prevailing on the date 28 days prior to the deadline for submission of bids published by the source specified in the BDS. If exchange rates are not so published for certain currencies, the Bidder shall state the rates used and the source. Bidders should note that for the purpose of payments, the exchange rates confirmed by the source specified in the BDS as the selling rates prevailing 28 days prior to the deadline for submission of Bids shall apply for the duration of the Contract so that no currency exchange risk is borne by the Bidder.</p>
	<p>15.5 Foreign currency requirements indicated by the Bidders in the Schedule of Payment Currencies shall include but not limited to the specific requirements for</p> <ul style="list-style-type: none"> <li>(a) expatriate staff and labor employed directly on the Works;</li> <li>(b) social, insurance, medical and other charges relating to such expatriate staff and labor, and foreign travel expenses;</li> </ul>

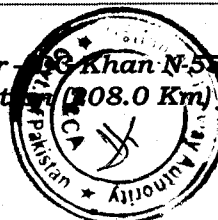


	<p>(c) imported materials, both temporary and permanent, including fuels, oil and lubricants required for the Works;</p> <p>(d) depreciation and usage of imported Plant and Contractor's Equipment, including spare parts, required for the Works;</p> <p>(e) foreign insurance and freight charges for imported materials, Plant and Contractor's Equipment, including spare parts; and</p> <p>(f) overhead expenses, fees, profit, and financial charges arising outside the Employer's country in connection with the Works.</p>
	<p>15.6 Bidders may be required by the Employer to clarify their foreign currency requirements, and to substantiate that the amounts included in the unit rates and prices and shown in the Schedule of Payment Currencies are reasonable and responsive to ITB 15.3 above, in which case a detailed breakdown of its foreign currency requirements shall be provided by the Bidder.</p>
	<p>15.7 Bidders should note that during the progress of the Works, the foreign currency requirements of the outstanding balance of the Contract Price may be adjusted by agreement between the Employer and the Contractor in order to reflect any changes in foreign currency requirements for the Contract, in accordance with Sub-Clause 14.15 of the Conditions of Contract. Any such adjustment shall be effected by comparing the percentages quoted in the bid with the amounts already used in the Works and the Contractor's future needs for imported items.</p>
<p><b>16. Documents Comprising the Technical Proposal</b></p>	<p>16.1 The Bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule, environmental, health and safety (EHS) management plan commensurate with the proposed scope of works, EHS Code of Conduct, and any other information as stipulated in Section 4 (Bidding Forms), in sufficient detail to demonstrate the adequacy of the Bidders' proposal to meet the work requirements and the completion time.</p>
<p><b>17. Documents Establishing the Qualifications of the Bidder</b></p>	<p>17.1 To establish its qualifications to perform the Contract in accordance with Section 3 (Evaluation and Qualification Criteria) the Bidder shall provide the information requested in the corresponding information sheets included in Section 4 (Bidding Forms).</p>
	<p>17.2 Domestic Bidders, individually or in Joint Ventures, applying for eligibility for domestic preference shall supply all information required to satisfy the criteria for eligibility as described in ITB 36.</p>
<p><b>18. Period of Validity of Bids</b></p>	<p>18.1 Bids shall remain valid for the bid validity period specified in the BDS. The bid validity period starts from the date fixed for the bid submission deadline date prescribed by the Employer in accordance with ITB 22.1. A bid valid for a shorter period shall be rejected by the Employer as nonresponsive.</p>
	<p>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 28 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.</p>





<p><b>19. Bid Security/Bid-Securing Declaration</b></p>	<p>19.1 Unless otherwise specified in the BDS, the Bidder shall furnish as part of its Bid, in original form, either a Bid-Securing Declaration or a bid security as specified in the BDS. In the case of a bid security, the amount and currency shall be as specified in the BDS.</p>
	<p>19.2 If a Bid-Securing Declaration is required pursuant to ITB 19.1, it shall use the form included in Section 4 (Bidding Forms). The Employer will declare a Bidder ineligible to be awarded a Contract for a specified period of time, as indicated in the BDS, if the Bid-Securing Declaration is executed.</p>
	<p>19.3 If a bid security is specified pursuant to ITB 19.1, the bid security shall be, at the Bidder's option, in any of the following forms:</p> <ul style="list-style-type: none"> <li>(a) an unconditional bank guarantee (hard copy of the bank guarantee or in the form of SWIFT message MT760), or</li> <li>(b) an irrevocable letter of credit, or</li> <li>(c) a cashier's or certified check</li> </ul> <p>all from a reputable source from an eligible country as described in Section 5 (Eligible Countries). In the case of a bank guarantee, the bid security shall be submitted either using the Bid Security Form included in Section 4 (Bidding Forms) or another form acceptable to the Employer. The form must include the complete name of the Bidder. The bid security shall be valid for 28 days beyond the original validity period of the bid, or beyond any period of extension if requested under ITB 18.2.</p>
	<p>19.4 Unless otherwise specified in the BDS, any Bid not accompanied by a substantially compliant bid security or Bid-Securing Declaration, if one is required in accordance with ITB 19.1, shall be rejected by the Employer as nonresponsive.</p>
	<p>19.5 If a bid security is specified pursuant to ITB 19.1, the bid security of substantially nonresponsive Technical Bids shall be returned before opening the Price Bids. The bid security of unsuccessful Bidders at Price Bid evaluation shall be returned promptly upon the successful Bidder's furnishing of the performance security pursuant to ITB 45.</p>
	<p>19.6 If a bid security is specified pursuant to ITB 19.1, the bid security of the successful Bidder shall be returned promptly once the successful Bidder has signed the Contract and furnished the required performance security.</p>
	<p>19.7 The bid security may be forfeited or the Bid Securing Declaration executed, if</p> <ul style="list-style-type: none"> <li>(a) notwithstanding ITB 24.3, 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</li> <li>(b) the successful Bidder fails to <ul style="list-style-type: none"> <li>(i) sign the Contract in accordance with ITB 44;</li> <li>(ii) furnish a performance security in accordance with ITB 45;</li> <li>(iii) accept the arithmetical correction of its Bid in accordance with ITB 34; or</li> <li>(iv) furnish a domestic preference security, if so required.</li> </ul> </li> </ul>



	<p>19.8 If the bid security is required as per ITB 19.1, 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 name of any or all of the Joint Venture partners. If the Bid-Securing Declaration is required as per ITB 19.1, the Bid-Securing Declaration 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-Securing Declaration shall be in the names of all future partners as named in the letter of intent mentioned in ITB 4.1.</p>
<p><b>20. Format and Signing of Bid</b></p>	<p>20.1 The Bidder shall prepare one original set of the Technical Bid and one original set 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 Technical and Price Bids, 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.</p>
	<p>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. If a Bidder submits a deficient authorization, the Bid shall not be rejected in the first instance. The Employer shall request the Bidder to submit an acceptable authorization within the number of days as specified in the BDS. Failure to provide an acceptable authorization within the period as stated in the Employer's request shall cause the rejection of the Bid. If either the Letter of Technical Bid or Letter of Price Bid or Bid-Securing Declaration (if applicable) is not signed, the Bid shall be rejected.</p>
	<p>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.</p>
<p><b>- D. Submission and Opening of Bids</b></p>	
<p><b>21. Sealing and Marking of Bids</b></p>	<p>21.1 Bidders shall submit their Bids as specified in the BDS. Procedures for submission, sealing, and marking are as follows:</p> <p>(a) Bidders submitting Bids by mail or by hand shall enclose the original of the Technical Bid, the original of the Price Bid, and each copy of the Technical Bid and each copy of the Price Bid, in separate sealed envelopes, duly marking the envelopes as "ORIGINAL - TECHNICAL BID," "ORIGINAL - PRICE BID," and "COPY NO... - TECHNICAL BID" and "COPY NO.... - PRICE BID." These envelopes, the first containing the originals and the others containing copies, shall then be enclosed in one single envelope per set. If permitted in accordance with ITB 13, alternative Bids shall be similarly sealed, marked and included in the sets. The rest of the procedure shall be in accordance with ITB 21.2 and ITB 21.5.</p> <p>(b) Bidders submitting Bids electronically shall follow the electronic bid submission procedures specified in the BDS.</p>
	<p>21.2 The inner and outer envelopes shall</p>



	<p>(a) bear the name and address of the Bidder;</p> <p>(b) be addressed to the Employer in accordance with BDS 22.1; and</p> <p>(c) bear the specific identification of this bidding process indicated in the BDS 1.1.</p>
	21.3 The outer envelopes and the inner envelopes containing the Technical Bid 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 envelopes 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.
<b>22. Deadline for Submission of Bids</b>	22.1 Bids must be received by the Employer at the address and no later than the date and time indicated in the BDS.
	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.
<b>23. Late Bids</b>	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.
<b>24. Withdrawal, Substitution, and Modification of Bids</b>	<p>24.1 A Bidder may withdraw, substitute, 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 for withdrawal notices, which do not require copies). The corresponding substitution or modification of the Bid must accompany the respective written notice. All notices must be</p> <p>(a) prepared and submitted in accordance with ITB 20 and ITB 21 (except for withdrawal notices, which do not require copies), and in addition, the respective envelopes shall be clearly marked "WITHDRAWAL," "SUBSTITUTION," "MODIFICATION"; and</p> <p>(b) received by the Employer no later than the deadline prescribed for submission of Bids, in accordance with ITB 22.</p>
	24.2 Bids requested to be withdrawn in accordance with ITB 24.1 shall be returned unopened to the Bidders.
	24.3 No Bid may be withdrawn, substituted, 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.
<b>25. Bid Opening</b>	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 and anyone who chooses to attend. Any specific electronic bid opening procedures required if electronic bidding is permitted in accordance with ITB 21.1, shall be as specified in the



	<p>BDS. 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 the Price Bid are submitted together in one envelope, the Employer may reject the entire Bid. Alternatively, the Price Bid may be immediately resealed for later evaluation.</p>
	<p>25.2 First, 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.</p>
	<p>25.3 Second, outer envelopes marked "SUBSTITUTION" shall be opened. The inner envelopes containing the Substitution Technical Bid and/or Substitution Price Bid shall be exchanged for the corresponding envelopes being substituted, which are to be returned to the Bidder unopened. Only the Substitution Technical Bid, if any, shall be opened, read out, and recorded. Substitution Price Bid will remain unopened in accordance with ITB 25.1. No envelope shall be substituted unless the corresponding substitution notice contains a valid authorization to request the substitution and is read out and recorded at bid opening.</p>
	<p>25.4 Next, outer envelopes marked "MODIFICATION" shall be opened. No Technical Bid and/or Price Bid shall be modified unless the corresponding modification notice contains a valid authorization to request the modification and is read out and recorded at the opening of Technical Bids. Only the Technical Bids, both Original as well as Modification, are to be opened, read out, and recorded at the opening. Price Bids, both Original as well as Modification, will remain unopened in accordance with ITB 25.1.</p>
	<p>25.5 All other envelopes holding the Technical Bids shall be opened one at a time, and the following read out and recorded:</p> <ul style="list-style-type: none"> <li>(a) the name of the Bidder;</li> <li>(b) whether there is a modification or substitution;</li> <li>(c) the presence of a bid security or Bid-Securing Declaration, if required; and</li> <li>(d) any other details as the Employer may consider appropriate.</li> </ul> <p>Only Technical Bids and alternative Technical Bids read out and recorded at bid opening shall be considered for evaluation. Unless otherwise specified in the BDS, all pages of the Letter of Technical Bid are to be initialed by at least three representatives of the Employer attending bid opening. No Bid shall be rejected at the opening of Technical Bids except for late bids, in accordance with ITB 23.1.</p>
	<p>25.6 The 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, substitution, or modification; alternative proposals; and the presence or absence of a bid security or Bid-Securing Declaration, if one was required. 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. A copy of the record shall be distributed to all Bidders who submitted Bids on time, and posted online when electronic bidding is permitted.</p>



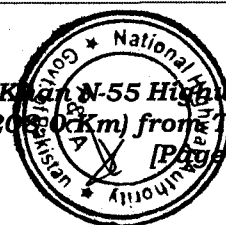
	<p>25.7 At the end of the evaluation of the Technical Bids, the Employer will invite bidders who have submitted substantially responsive Technical Bids and who have been determined as being qualified for award to attend the opening of the Price Bids. The date, time, and location of the opening of Price Bids will be advised in writing by the Employer. Bidders shall be given reasonable notice of the opening of Price Bids.</p>
	<p>25.8 The Employer will notify in writing Bidders who have been rejected for submitting nonresponsive Technical Bids and return their Price Bids unopened together with their bid securities, before opening the Price Bids of the substantially responsive Bidders.</p>
	<p>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.</p>
	<p>25.10 All envelopes containing Price Bids shall be opened one at a time and the following read out and recorded:</p> <ul style="list-style-type: none"> <li>(a) the name of the Bidder;</li> <li>(b) whether there is a modification or substitution;</li> <li>(c) the Bid Prices, including any discounts and alternative offers; and</li> <li>(d) any other details as the Employer may consider appropriate.</li> </ul> <p>Only Price Bids discounts, and alternative offers read out and recorded during the opening of Price Bids shall be considered for evaluation. Unless otherwise specified in the BDS, all pages of the Letter of Price Bid and Bill of Quantities are to be initialed by at least three representatives of the Employer attending bid opening. No Bid shall be rejected at the opening of Price Bids.</p>
	<p>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, 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. A copy of the record shall be distributed to all Bidders who submitted Bids on time, and posted online when electronic bidding is permitted.</p>
<p><b>E. Evaluation and Comparison of Bids</b></p>	
<p><b>26. Confidentiality</b></p>	<p>26.1 Information relating to the examination, evaluation, comparison, and postqualification 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 the Contract award is communicated to all Bidders.</p>
	<p>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.</p>



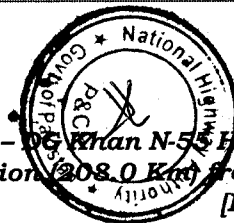
	26.3 Notwithstanding ITB 26.2, from the time of bid opening to the time of Contract award, if any Bidder wishes to contact the Employer on any matter related to the bidding process, it may do so in writing.
<b>27. Clarification of Bids</b>	27.1 To assist in the examination, evaluation, and comparison 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 34.
	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.
<b>28. Deviations, Reservations, and Omissions</b>	28.1 During the evaluation of Bids, the following definitions apply: <ul style="list-style-type: none"> <li>(a) "Deviation" is a departure from the requirements specified in the Bidding Document;</li> <li>(b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Document; and</li> <li>(c) "Omission" is the failure to submit part or all of the information or documentation required in the Bidding Document.</li> </ul>
<b>29. Examination of Technical Bids</b>	29.1 The 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. <ul style="list-style-type: none"> <li>(a) Letter of Technical Bid;</li> <li>(b) written confirmation of authorization to commit the Bidder;</li> <li>(c) Bid Security or Bid-Securing Declaration, if applicable; and</li> <li>(d) Technical Proposal in accordance with ITB 16.</li> </ul>
<b>30. Responsiveness of Technical Bid</b>	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.
	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, <ul style="list-style-type: none"> <li>(a) if accepted, would: <ul style="list-style-type: none"> <li>(i) affect in any substantial way the scope, quality, or performance of the Works specified in the Contract; or</li> <li>(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</li> </ul> </li> </ul>



	(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 6 (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.
<b>31. Nonmaterial Nonconformities</b>	31.1 Provided that a Bid is substantially responsive, the Employer may waive any nonconformities 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 method indicated in Section 3 (Evaluation and Qualification Criteria).
<b>32. Qualification of the Bidder</b>	32.1 The Employer shall determine to its satisfaction during the evaluation of Technical Bids whether Bidders meet the qualifying criteria specified in Section 3 (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. Unless permitted in the BDS, the determination shall not take into consideration the qualifications of other firms such as the Bidder's subsidiaries, parent entities or affiliates.
	32.3 An affirmative determination shall be a prerequisite for the opening and evaluation of a Bidder's Price Bid. The Employer reserves the right to reject the bid of any bidder found to be in circumstances described in Sub-Clause GCC 15.2.1 (g) or Sub-Clause PCC 15.2.1 (h). 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.
<b>33. Subcontractors</b>	33.1 Unless otherwise stated in the BDS, the Employer does not intend for the contractor to execute any specific elements of the Works through nominated subcontractors.
	33.2 If subcontractors are proposed for any of the key activities listed in Section 3 (Evaluation and Qualification) Criteria 2.4.2, they shall be considered as "Specialist Subcontractors" and shall meet qualification requirements for the relevant key activities.

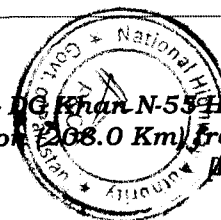


<p><b>34. Correction of Arithmetical Errors</b></p>	<p>34.1 During the evaluation of Price Bids, the Employer shall correct arithmetical errors on the following basis:</p> <p>(a) If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, 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.</p> <p>(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.</p> <p>(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.</p> <p>(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.</p>
	<p>34.2 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 may be forfeited or its Bid-Securing Declaration executed.</p>
<p><b>35. Conversion to Single Currency</b></p>	<p>35.1 For evaluation and comparison purposes, the currency(ies) of the Bid shall be converted into a single currency as specified in the BDS.</p>
<p><b>36. Domestic Preference</b></p>	<p>36.1 Unless otherwise specified in the BDS, domestic preference shall not apply.</p>
<p><b>37. Evaluation and Comparison of Price Bids</b></p>	<p>37.1 The Employer shall use the criteria and methodologies listed in this Clause. No other evaluation criteria or methodologies shall be permitted.</p>
	<p>37.2 To evaluate the Price Bid, the Employer shall consider the following:</p> <p>(a) the bid price, excluding Provisional Sums and the provision, if any, for contingencies in the Summary Bill of Quantities, but including Daywork items, where priced competitively;</p> <p>(b) price adjustment for correction of arithmetic errors in accordance with ITB 34.1;</p> <p>(c) price adjustment due to discounts offered in accordance with ITB 14.4;</p> <p>(d) converting the amount resulting from applying (a) to (c) above, if relevant, to a single currency in accordance with ITB 35;</p> <p>(e) adjustment for nonmaterial nonconformities in accordance with ITB 31.3;</p> <p>(f) assessment whether the bid is abnormally low in accordance with ITB 38; and</p> <p>(g) application of all the evaluation factors indicated in Section 3 (Evaluation and Qualification Criteria).</p>





	37.3 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.
	37.4 If this Bidding Document allows Bidders to quote separate prices for different contracts, and the award to a single Bidder of multiple contracts, 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 3 (Evaluation and Qualification Criteria).
	37.5 The Employer shall compare all substantially responsive Bids to determine the lowest evaluated Bid price, in accordance with ITB 37.2.
<b>38. Abnormally Low bids</b>	<p>38.1 An abnormally low bid is one where the bid price, in combination with other elements of the bid, appears to be so low that it raises concerns as to the capability of the Bidder to perform the contract for the offered bid price.</p> <p>38.2 When the offered bid price appears to be abnormally low, the Employer shall undertake a three-step review process as follows:</p> <ul style="list-style-type: none"> <li>(a) identify abnormally low costs and unit rates by comparing them with the engineer's estimates, other substantially responsive bids, or recently awarded similar contracts;</li> <li>(b) clarify and analyze the bidder's resource inputs and pricing, including overheads, contingencies and profit margins; and</li> <li>(c) decide whether to accept or reject the bid.</li> </ul> <p>38.3 With regard to ITB 38.2 (b) above, the Employer will seek a written explanation from the bidder of the reasons for the offered bid price, including a detailed analysis of costs and unit prices, by reference to the scope, proposed methodology, schedule, and allocation of risks and responsibilities. This may also include information regarding the economy of the manufacturing process; the services to be provided, or the construction method to be used; the technical solutions to be adopted; and any exceptionally favorable conditions available to the bidder for the works, equipment or services proposed.</p> <p>38.4 After examining the explanation given and the detailed price analyses presented by the bidder, the Employer may:</p> <ul style="list-style-type: none"> <li>(a) accept the bid, if the evidence provided satisfactorily accounts for the low bid price and costs, in which case the bid is not considered abnormally low;</li> <li>(b) accept the bid, but require that the amount of the performance security be increased at the expense of the bidder to a level sufficient to protect the Employer against financial loss. The amount of the performance security shall generally be not more than 20% of the contract price; or</li> <li>(c) reject the bid if the evidence provided does not satisfactorily account for the low bid price, and make a similar determination for the next ranked bid, if required.</li> </ul>
<b>39. Unbalanced or Front-Loaded Bids</b>	39.1 If the Bid, 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 analyses 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, as well as the pricing and sources of materials, equipment and labor.



	<p>39.2 After the evaluation of the information and detailed price analyses presented by the Bidder, the Employer may as appropriate:</p> <p>(a) accept the Bid; or</p> <p>(b) accept the Bid, but require that the total amount of the Performance Security be increased at the expense of the Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract subject to ITB 45.2; or</p> <p>(c) reject the Bid and make a similar determination for the next ranked bid.</p>
<b>40. Employer's Right to Accept Any Bid, and to Reject Any or All Bids</b>	40.1 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.
<b>41. Notice of Intention for Award of Contract</b>	41.1 If Standstill provisions apply as specified in the BDS, the standstill period shall be defined in the BDS to specify the duration subsequent to notification of intention for award of contract (before making the actual contract award) within which any unsuccessful bidder can challenge the proposed award.
<b>F. Award of Contract</b>	
<b>42. Award Criteria</b>	42.1 The Employer shall award the Contract to the Bidder whose offer has been determined in line with ITB 37 to ITB 39 above 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.
<b>43. Notification of Award</b>	<p>43.1 Prior to the expiration of the period of bid validity, and upon expiry of the standstill period specified in ITB 41.1, or upon satisfactory resolution of a complaint filed within standstill period, if applicable, the Employer shall transmit the Notification of Award through issuance of Letter of Acceptance using the form included in Section 9 (Contract Forms) to the successful Bidder, in writing, that its Bid has been accepted.</p> <p>43.2 Unless standstill period applies, upon notification of award through issuance of Letter of Acceptance, 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 and/or in a debriefing meeting to any unsuccessful Bidder who, after publication of contract award, requests a debriefing.</p> <p>43.3 Until a formal contract is prepared and executed, the notification of award through issuance of Letter of Acceptance shall constitute a binding Contract.</p> <p>43.4 Within 2 weeks of the award of contract or expiry of the standstill period, where such period applies, or, if a complaint has been filed within the standstill period, upon receipt of ADB's confirmation of satisfactory resolution of the complaint, the borrower shall publish in an English language newspaper or widely known and freely accessible website the results identifying the bid and lot or package numbers, as applicable and the following information:</p>



	<p>(a) name of each Bidder who submitted a Bid;</p> <p>(b) bid prices as read out at bid opening;</p> <p>(c) name and evaluated prices of each Bid that was evaluated;</p> <p>(d) name of Bidders whose bids were rejected and the reasons for their rejection; and</p> <p>(e) name of the winning Bidder, and the price it offered, as well as the duration and summary scope of the contract awarded.</p>
<b>44. Signing of Contract</b>	<p>44.1 The Employer shall send the successful Bidder the Contract Agreement together with or promptly after the issuance of Letter of Acceptance.</p> <p>44.2 Within 35 days of receipt of the Contract Agreement, the successful Bidder shall sign, date, and return it to the Employer.</p>
<b>45. Performance Security</b>	<p>45.1 Within 28 days of the receipt of notification of award through issuance of Letter of Acceptance from the Employer, the successful Bidder shall furnish the performance security in accordance with the conditions of contract, subject to ITB 38 and ITB 39, using for that purpose the Performance Security Form included in Section 9 (Contract Forms), or another form acceptable to the Employer. If the bank issuing performance security is located outside the Employer's country, it shall be counter-guaranteed or encashable by a bank in the Employer's country.</p> <p>45.2 Failure of the successful Bidder to submit the abovementioned performance security or to sign the Contract Agreement shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security or execution of the Bid-Securing Declaration. 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.</p> <p>45.3 The above provision shall also apply to the furnishing of a domestic preference security if so required.</p>
<b>46. Bidding-Related Complaints</b>	<p>46.1 The procedures for dealing with Bidding-Related Complaints arising out of this bidding process are specified in the BDS.</p>



## Section 2: Bid Data Sheet

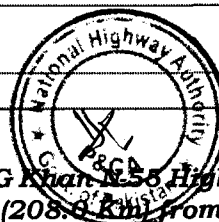
This section consists of provisions that are specific to each procurement and supplement the information or requirements included in Section 1 (Instructions to Bidders).

### A. General

ITB 1.1	The number of the Invitation for Bids (IFB) is: <b>OCB/CAREC/T-III</b>
ITB 1.1	The Employer is: <b>National Highway Authority</b>
ITB 1.1	<p>The name of the open competitive bidding (OCB) is: <b>Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane</b></p> <p>The identification number of the OCB is: <b>OCB/CAREC/T-III</b></p> <p>The number and identification of lots comprising this OCB is: <b>Four (04)</b></p> <p><b>Lot-1: Rajanpur – Jampur Section (57.50 Km)</b></p> <p><b>Lot-2: Jampur – DG Khan Section (64.0 Km)</b></p> <p><b>Lot-3: DG Khan to Tibi Qaisrani via Shahdan Lund Section (111.70 Km)</b></p> <p><b>Lot- 4: Tibi Qaisrani to DI Khan via Ramak Section (96.245 Km)</b></p> <p>The bidder has the option to bid any number of lots.</p>
ITB 2.1	The Borrower is: <b>Islamic Republic of Pakistan</b>
ITB 2.1	The name of the Project is: <b>Central Asia Regional Economic Cooperation (CAREC) Corridor Development Investment Program – Tranche-III Projects</b>

### B. Contents of Bidding Documents

ITB 7.1	<p>For <b>clarification purposes</b> only, the Employer's address is:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Attention:</td> <td><b>General Manager (P&amp;CA)</b></td> </tr> <tr> <td>Street address:</td> <td><b>National Highway Authority 28-Mauve Area, Sector: G-9/1 Islamabad, Pakistan</b></td> </tr> <tr> <td>Floor / Room number:</td> <td><b>Committee Room, 2nd Floor, Room No. 223</b></td> </tr> <tr> <td>City:</td> <td><b>Islamabad</b></td> </tr> <tr> <td>ZIP code:</td> <td><b>44000</b></td> </tr> <tr> <td>Country:</td> <td><b>Islamic Republic of Pakistan</b></td> </tr> <tr> <td>Telephone:</td> <td><b>+92-51-9032727</b></td> </tr> <tr> <td>Fax No.</td> <td><b>+92-51-9260419</b></td> </tr> <tr> <td>E-mail address:</td> <td><b>gmpca.nha@gmail.com &amp; gmpca@nha.gov.pk</b></td> </tr> </table>	Attention:	<b>General Manager (P&amp;CA)</b>	Street address:	<b>National Highway Authority 28-Mauve Area, Sector: G-9/1 Islamabad, Pakistan</b>	Floor / Room number:	<b>Committee Room, 2nd Floor, Room No. 223</b>	City:	<b>Islamabad</b>	ZIP code:	<b>44000</b>	Country:	<b>Islamic Republic of Pakistan</b>	Telephone:	<b>+92-51-9032727</b>	Fax No.	<b>+92-51-9260419</b>	E-mail address:	<b>gmpca.nha@gmail.com &amp; gmpca@nha.gov.pk</b>
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E-mail address:	<b>gmpca.nha@gmail.com &amp; gmpca@nha.gov.pk</b>																		
ITB 7.4	<p>A Pre-Bid meeting shall take place.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Date:</td> <td><b>26<sup>th</sup> August 2024</b></td> </tr> </table>	Date:	<b>26<sup>th</sup> August 2024</b>																
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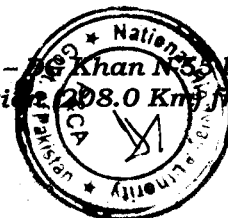


Time:	<b>1100 Hours (Islamabad Time)</b>
Place:	<b>Committee Room, 2nd Floor, Room No. 223 Address: National Highway Authority 28-Mauve Area, Sector: G-9/1 Islamabad, Pakistan</b>
City:	<b>Islamabad</b>
Country:	<b>Islamic Republic of Pakistan</b>

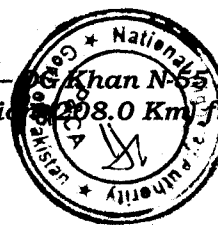
A site visit conducted by the Employer **will not** be organized.

### C. Preparation of Bids

<b>ITB 10.1</b>	The language of the Bid is: <b>English</b> . The translation of the documents shall be duly notarized.
<b>ITB 11.2 (g)</b>	The Bidder shall submit with its Technical Bid the following additional documents: <ul style="list-style-type: none"> <li>i. Quality Control Methods for Asphalt &amp; Concrete Work.</li> <li>ii. Construction Schedule (on Primavera /MS project or equivalent) by allocating the equipment and other resources; critical activities must be identified.</li> <li>iii. Diversion of Traffic and Safety Management Plan.</li> <li>iv. Environmental Safety Plan.</li> <li>v. Letter of Acceptance / Award, completion certificates, IPCs / BOQs to substantiate construction experience.</li> <li>vi. Documents indicating availability of financial resources shown by the bidder to meet the requirement of Sr. No. 2.3.3, Section-3 (i.e. audited standalone (not consolidated) financial statements, line of credit confirmed by issuing bank within last three months, etc.).</li> </ul> <p>Bidders are required to submit all documents to support their bid in English language. If the documentary evidence is in a language other than the English language, then the bidder shall submit accurate translation of the relevant passages in the English language duly attested by the notary public of the Bidder's Country or similar legal instrument of notarization as applicable under the laws of the Bidder's home country, (specifying the authority for such attestation as per law of the country).</p> <p>If a Bidder omits to submit any of the above documents or the documents submitted are deficient, the Bid shall not be rejected in the first instance and a clarification will be sought from the Bidder under ITB 27.</p>
<b>ITB 11.3 (d)</b>	The Bidder shall submit with its Price Bid the following additional documents: <ul style="list-style-type: none"> <li>• Any other documents mentioned in Section-4 Page 88, 89, 90 and 91 "Schedule of payment currency".</li> <li>• Unit price analysis for major items of works.</li> </ul>
<b>ITB 11.4</b>	The Joint Venture Agreement or a Letter of Intent to execute a Joint Venture Agreement in the event of the successful Bid, shall include the following: <ul style="list-style-type: none"> <li>(a) All partners shall be jointly and severally liable.</li> <li>(b) The lead partner shall be clearly identified, nominated and designated as the Representative of the Joint Venture.</li> </ul>



	<p>(c) The financial share of each partner shall be clearly stated.</p> <p>(d) Corresponding to the financial share of each Partner, the roles and responsibilities of each partner, including the separate scope or part of the Works (if any) to be carried out by each partner, shall also be specified; and</p> <p>(e) Any other requirements as per the applicable law.</p> <p>In case a Letter of Intent to execute a Joint Venture Agreement is submitted by the successful Bidder at the time of submission of the Bid, the Bidder shall be bound to submit a duly executed Joint Venture Agreement to the Employer immediately after the issuance of Letter of Acceptance but not later than 28 days after the issuance of the same. Such Joint Venture Agreement, thus submitted by the successful Bidder must contain the information postulated above. Failure to comply with this condition may lead to 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 <u>substantially responsive</u> and is <u>determined</u> by the Employer to be qualified to perform the Contract satisfactorily.</p>
ITB 12.1	The units and rates in figures entered into the Bill of Quantities and Daywork Schedule should be unambiguous and typewritten, if written by hand, must be in print form. Bill of Quantities and Daywork Schedule not presented accordingly may be considered nonresponsive.
ITB 13.1	Alternative Bids <b>shall not</b> be permitted.
ITB 13.2	Alternative times for completion <b>shall not</b> be permitted. If alternative times for completion are permitted, the evaluation method will be as specified in Section 3 (Evaluation and Qualification Criteria).
ITB 13.4	Alternative technical solutions shall be permitted for the following parts of the Works: <b>Not Applicable</b>
ITB 14.5	The prices quoted by the Bidder <b>Adjustable</b> . <b>The formula for adjusting the prices and explanatory details is specified in the GCC Clause 13.7. Bidder shall fill out the Tables of Adjustment Data in Section 4 (Bidding Forms).</b>
ITB 15.1	The unit rates and the prices shall be quoted by the Bidder entirely in <b>Pakistan Rupees</b> .
ITB 15.4	The rates of exchange shall be the selling rates 28 days prior to the deadline for submission of bids published by <b>State Bank of Pakistan</b> .
ITB 18.1	The bid validity period shall be <b>one hundred and eighty (180) days</b> . Note: This is applicable for each lot separately.
ITB 19.1	The Bidder shall furnish a <b>bid security</b> in the following for each lot: <b>Lot-1: Pak. Rs. 275.0 million or US\$ 1.00 million.</b> <b>Lot-2: Pak. Rs. 332 million or US\$ 1.20 million.</b>



	<p><b>Lot-3: Pak. Rs. 553 million or US\$ 2.00 million.</b></p> <p><b>Lot-4: Pak. Rs. 419 million or US\$ 1.50 million.</b></p>
<b>ITB 19.4</b>	<p>Subject to the succeeding sentences, any bid not accompanied by an irrevocable and callable Bid-Security shall be rejected by the Employer as nonresponsive. If a Bidder submits a Bid-Security that (i) deviates in form, amount, and/or period of validity or (ii) does not provide sufficient identification of the Bidder (including, without limitation, failure to indicate the name of the Joint Venture or, where the Joint Venture has not yet been constituted, the names of all future Joint Venture Partners), the Employer shall request the Bidder to submit a compliant Bid-Security within <b>Seven (07)</b> days of receiving such a request. Failure to provide a compliant Bid-Security within the prescribed period of receiving such a request shall cause the rejection of the Bid.</p>
<b>ITB 20.1</b>	<p>In addition to the original Bid, the number of copies is: <b>Two (02)</b></p> <p>To facilitate evaluation, bidders are encouraged to submit soft copies (Flash drive/ USB) one each in PDF format with its Technical Bid and Price Bid. The soft copy copies (Flash drive/ USB) of the Technical Bid shall be enclosed in the envelope containing the hard copy of the Bidder's Original Technical Bid, and the soft copy (Flash drive/ USB) of the Price Bid shall be enclosed in the envelope containing the hard copy of the Bidder's Original Price Bid. If there is any discrepancy between the data/information in the soft copy (Flash drive/ USB) of the Bidder's Technical Bid and the hard copy of the Bidder's Technical Bid and between the price indicated in the hard copy of the Bidder's Original Price Bid, and in the soft copy (Flash drive/ USB) of the Bidder's Price Bid, the data and information indicated in the hard copy of the Original Technical Bid and the Original Price Bid shall prevail.</p> <p>In addition to above, soft copy of Financial Bid in "<b>Excel format</b>" shall also be enclosed in the envelope containing the hard copy of the Bidder's Original Price Bid, to facilitate review and evaluation process.</p> <p><b>Note:</b> Submission of the (Flash drive/ USB) is only for reference and shall not constitute electronic bid submission as stipulated in ITB 25.1.</p>
<b>ITB 20.2</b>	<p>The written confirmation of authorization to sign on behalf of the Bidder shall consist of a board resolution or its equivalent, or power of attorney, which should either be:</p> <p>a) <i>notarized, or</i></p> <p>b) <i>attested to by an appropriate forum (authority) in the Bidder's home country, specifying the representative's authority to sign the bid on behalf of the bidder.</i></p> <p><i>If the bidder is an intended or existing joint venture, such authorization should be signed by all parties and specify the representative's authority to sign the bid on behalf of the intended or existing joint venture.</i></p> <p><i>If the joint venture has not yet been formed, such authorization also includes written evidence from all proposed partners of joint venture of their intent to enter into a joint venture in the event of a contract award.</i></p>
<b>ITB 20.2</b>	<p>The Bidder shall submit an acceptable authorization within <b>Seven (07)</b> days.</p>



### D. Submission and Opening of Bids

ITB 21.1	Bidders shall submit their Bids by mail or by hand.																
ITB 21.1 (b)	Electronic bidding submission procedures shall be: <b>Not Applicable.</b>																
ITB 22.1	<p>For <b>bid submission purposes</b> only, the Employer's address is:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Attention:</td> <td><b>General Manager (P&amp;CA)</b></td> </tr> <tr> <td>Street address:</td> <td><b>National Highway Authority 28-Mauve Area, Sector: G-9/1 Islamabad, Pakistan</b></td> </tr> <tr> <td>Floor / Room number:</td> <td><b>Committee Room, 2<sup>nd</sup> Floor, Room No. 223</b></td> </tr> <tr> <td>City:</td> <td><b>Islamabad</b></td> </tr> <tr> <td>ZIP code:</td> <td><b>44000</b></td> </tr> <tr> <td>Country:</td> <td><b>Islamic Republic of Pakistan</b></td> </tr> </table> <p>The deadline for bid submission is:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Date:</td> <td><b>26<sup>th</sup> September 2024</b></td> </tr> <tr> <td>Time:</td> <td><b>1100 Hours</b></td> </tr> </table>	Attention:	<b>General Manager (P&amp;CA)</b>	Street address:	<b>National Highway Authority 28-Mauve Area, Sector: G-9/1 Islamabad, Pakistan</b>	Floor / Room number:	<b>Committee Room, 2<sup>nd</sup> Floor, Room No. 223</b>	City:	<b>Islamabad</b>	ZIP code:	<b>44000</b>	Country:	<b>Islamic Republic of Pakistan</b>	Date:	<b>26<sup>th</sup> September 2024</b>	Time:	<b>1100 Hours</b>
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ITB 25.1	<p>The opening of the Technical Bid shall take place at:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Street address:</td> <td><b>National Highway Authority 28-Mauve Area, Sector: G-9/1 Islamabad, Pakistan</b></td> </tr> <tr> <td>Floor / Room number:</td> <td><b>Committee Room, 2nd Floor, Room No. 223</b></td> </tr> <tr> <td>City:</td> <td><b>Islamabad</b></td> </tr> <tr> <td>ZIP code:</td> <td><b>44000</b></td> </tr> <tr> <td>Country:</td> <td><b>Islamic Republic of Pakistan</b></td> </tr> <tr> <td>Date:</td> <td><b>26<sup>th</sup> September 2024</b></td> </tr> <tr> <td>Time:</td> <td><b>1130 Hours</b></td> </tr> </table>	Street address:	<b>National Highway Authority 28-Mauve Area, Sector: G-9/1 Islamabad, Pakistan</b>	Floor / Room number:	<b>Committee Room, 2nd Floor, Room No. 223</b>	City:	<b>Islamabad</b>	ZIP code:	<b>44000</b>	Country:	<b>Islamic Republic of Pakistan</b>	Date:	<b>26<sup>th</sup> September 2024</b>	Time:	<b>1130 Hours</b>		
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ITB 25.1	Electronic bid opening procedure shall be as follows: <b>Not Applicable</b>																
ITB 25.5	The Letter of Technical Bid shall be initialled by <b>at least three (03)</b> representatives of the Employer attending Bid opening.																
ITB 25.10	The Letter of Price Bid and Bill of Quantities shall be initialled by <b>at least three (03)</b> representatives of the Employer attending Bid opening.																

### E. Evaluation and Comparison of Bids

ITB 32.2	The qualifications of other firms such as the Bidder's subsidiaries, parent entities, or affiliates <b>shall not</b> be permitted.
ITB 33.1	The Employer <b>does not intend</b> for the contractor to execute any specific elements of the Works through nominated subcontractors.
ITB 35.1	<p>The currency that shall be used for bid evaluation and comparison purposes to convert all bid prices expressed in various currencies into a single currency is: <b>Pak Rupees (PKR)</b></p> <p>The source of the selling exchange rate shall be: <b>State Bank of Pakistan</b></p>



	The date for the selling exchange rate shall be: <b>28 days prior to the deadline for submission of bids.</b>
ITB 36.1	Domestic preference <b>shall not apply.</b>
ITB 41.1	<p>Standstill provisions shall apply. The duration of standstill period will be <b>ten (10) days</b> from the date of notice of intention for award of contract.</p> <p>The Employer shall, at the start of the standstill period, notify in writing each Bidder that submitted a bid, of its intention to award a contract to the successful Bidder at the end of standstill period. The notification using the form included in Section 9 (Contract Forms) shall include the following information:</p> <p>(a) the name of each Bidder who submitted a Bid.</p> <p>(b) the bid prices as read out at bid opening.</p> <p>(c) the name and evaluated prices of each Bid that was evaluated.</p> <p>(d) the name of Bidders whose bids were rejected and the reasons for their rejection.</p> <p>(e) the name of the winning Bidder, and the price it offered, as well as the duration and summary scope of the contract awarded; and</p> <p>(f) a statement of the reason(s) the bid of the unsuccessful Bidder to whom the notification is addressed was unsuccessful, unless the price information under (e) of this paragraph already reveals the reason.</p>

#### F. Award of Contracts

ITB 46.1	<p>The procedures for Bidding-Related Complaints are referenced in the Procurement Regulations for ADB Borrowers (Appendix 7). The Bidder should submit its complaint following these procedures, in writing, to:</p> <p>For the attention: Grievance Redressal Committee Chairman  Title / Position: General Manager (Planning)  Employer: National Highway Authority  28 Mauve Area, G-9/1, Islamabad, Pakistan</p> <p>Project: CAREC, T-III Projects  Email address: gmplanningnha@gmail.com  Fax number: +92-51-9260346</p>
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# Section 3: Evaluation and Qualification Criteria

## - Without Prequalification -

This Section contains all the criteria that the Employer shall use to evaluate bids and qualify Bidders. In accordance with ITB 32 to ITB 36, no other methods, criteria and factors shall be used. The Bidder shall provide all the information requested in the forms included in Section 4 (Bidding Forms).

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## 1. Evaluation

In addition to the criteria listed in ITB 37.2 (a)–(f), other relevant factors are as follows:

### 1.1 Adequacy of Technical Proposal

Evaluation of the Bidder's Technical Proposal will include an assessment of the Bidder's technical capacity to successfully implement the contract considering its proposed site organization, method statement, mobilization, and construction schedule (to be described by the Bidder in sufficient detail to demonstrate the adequacy of its work methods, scheduling, and material sourcing) including the extent to which they are presented in a consistent manner and comply with requirements stipulated in Section 6 (Works' Requirements) without material deviation, reservation, or omission.

Noncompliance with equipment and key personnel requirements described in Section 6 (Works' Requirements) shall not normally be a ground for bid rejection, and such noncompliance will be subject to clarification during bid evaluation and rectification prior to contract award.

### 1.2 Completion Time

An alternative Completion Time, if permitted under ITB 13.2, will be evaluated as follows:  
**Not Applicable**

### 1.3 Technical Alternatives

Technical alternatives, if permitted under ITB 13.4, will be evaluated as follows:  
**Not Applicable**

### 1.4 Specialist Subcontractors

Only the specific experience of Specialist Subcontractors for key activities specified in criterion 2.4.2 Construction Experience in Key Activities will be considered. The experience of Specialist Subcontractors in contracts of similar size and nature, and their financial resources shall not be added to those of the Bidder for purposes of qualification of the Bidder.

### 1.5 Quantifiable Nonconformities and Omissions

Subject to ITB 14.2 and ITB 37.2, the evaluated cost of quantifiable nonconformities including omissions, is determined as follows:

Pursuant to ITB 31.3, the cost of all quantifiable nonmaterial nonconformities shall be evaluated, including omissions in Daywork where competitively priced but excluding omission of prices in the Bill of Quantities. 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 Domestic Preference

If domestic preference is provided for under ITB 36.1, the following procedure shall apply:  
**Not Applicable**

### 1.7 Other Criteria

The Other Criteria is described as under:



### 1.7.1 Environmental, Health and Safety Management Plan (EHSMP)

Any bid not accompanied by the EHSMP may be rejected by the Employer as nonresponsive. If a Bidder submits a EHSMP that is not commensurate with the risks and impacts of the proposed works and activities in the bidding document, the Employer shall issue a request for clarification to request for further information from the Bidder. The Bidder must submit the requested information within **five (05)** days of receiving such a request. Failure to provide a satisfactory response to the request for further information within the prescribed period of receiving such a request may cause the rejection of the Bid.

### 1.7.2 Sustainable Procurement

**Not Applicable**

### 1.7.3 Life Cycle Costs (for Financial Evaluation)

Life cycle costing **shall not apply**.

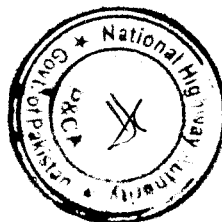
## 1.8 Multiple Contracts

Works are grouped in multiple contracts, and pursuant to ITB 37.4, the Employer shall 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.

- **Lot-1:** Rajanpur – Jampur Section (57.50 Km)
- **Lot-2:** Jampur – DG Khan Section (64.0 Km)
- **Lot-3:** DG Khan to Tibi Qaisrani via Shahdan Lund Section (111.70 Km)
- **Lot-4:** Tibi Qaisrani to DI Khan via Ramak Section (96.245 Km)

If a Bidder as defined in ITB 4.1 submits several successful (lowest evaluated substantially responsive) bids, the evaluation will also include an assessment of the Bidder's capacity to meet the following aggregated requirements as presented in the bid:

- Average annual construction turnover,
- Financial resources,
- Equipment to be allocated, and
- Personnel to be fielded.



## 2. Evaluation

### 2.1 Eligibility

Criteria Requirement	Compliance Requirements				Documents
	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	

#### 2.1.1 Nationality

Nationality in accordance with ITB 4.2.	Must meet requirement	Must meet requirement	Must meet requirement	Not applicable	Forms ELI - 1; ELI - 2 with attachments
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#### 2.1.2 Conflict of Interest

No conflicts of interest in accordance with ITB 4.3.	Must meet requirement	Must meet requirement	Must meet requirement	Not applicable	Letter of Technical Bid
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#### 2.1.3 ADB Eligibility

Not having been declared ineligible by ADB, as described in ITB 4.4.	Must meet requirement	Must meet requirement	Must meet requirement	Not applicable	Letter of Technical Bid
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#### 2.1.4 Government-Owned Entity

Bidder required to meet conditions of ITB 4.5.	Must meet requirement	Must meet requirement	Must meet requirement	Not applicable	Forms ELI - 1; ELI - 2 with attachments
--	-----------------------	-----------------------	-----------------------	----------------	---

#### 2.1.5 United Nations Eligibility

Not having been excluded by an act of compliance with a United Nations Security Council resolution in accordance with ITB 4.8.	Must meet requirement	Must meet requirement	Must meet requirement	Not applicable	Letter of Technical Bid
--	-----------------------	-----------------------	-----------------------	----------------	-------------------------

#### 2.1.6 Registration with Pakistan Engineering Council (PEC)

<p>The successful Bidder must be registered with Pakistan Engineering Council (PEC) and shall have a valid registration Certificate in following category with Specialization in <b>CE-01 &amp; CE-02</b> before signing the Contract.</p> <p><b>Lot - 1           Category C-A</b>  <b>Lot - 2           Category C-A</b>  <b>Lot - 3           Category C-A</b>  <b>Lot - 4           Category C-A</b></p> <p>If the successful bidder is a JV including a local firm whose registration is expired at the time</p>	must meet requirement	not applicable	must meet requirement	Not applicable	Forms ELI - 1; ELI - 2 with attachments
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of Bid submission, the firm shall be required to submit a valid PEC registration certificate before signing the Contract. If the successful bidder is a single entity or JV comprises a foreign firm, the foreign firm shall be required to submit a valid PEC registration certificate before signing of the Contract.					
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## 2.2 Historical Contract Nonperformance

### 2.2.1 History of Nonperforming Contracts

Criteria Requirement	Compliance Requirements				Documents Submission Requirements
	Single Entity	Joint Venture			
		All Partners Combined	Each Partner	One Partner	
Nonperformance of a contract <sup>2</sup> did not occur as a result of contractor default since 1 July 2018.	Must meet requirement	Must meet requirement	Must meet requirement <sup>3</sup>	Not applicable	Form CON-1

### 2.2.2 Suspension Based on Execution of Bid-Securing Declaration

Criteria Requirement	Compliance Requirements				Documents Submission Requirements
	Single Entity	Joint Venture			
		All Partners Combined	Each Partner	One Partner	
Not under suspension based on execution of a Bid-Securing Declaration pursuant to ITB 4.6.	Must meet requirement	Must meet requirement	Must meet requirement	Not applicable	Letter of Technical Bid

### 2.2.3 Pending Litigation and Arbitration

Pending litigation and arbitration criterion shall apply.

Criteria Requirement	Compliance Requirements				Documents Submission Requirements
	Single Entity	Joint Venture			
		All Partners Combined	Each Partner	One Partner	
All pending litigation, arbitration, or other material events impacting the net worth and/or liquidity of the bidder, if any, shall be treated as resolved against the Bidder	Must meet requirement	Not applicable	Must meet requirement	Not applicable	Form CON - 1

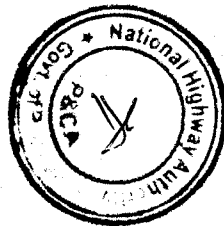
- <sup>2</sup> Nonperformance, as decided by the Employer, shall include all contracts where (i) nonperformance was not challenged by the contractor, including through referral to the dispute resolution mechanism under the respective contract; and (ii) contracts that were so challenged but fully settled against the contractor. Nonperformance shall not include contracts where the Employer's decision was overruled by the dispute resolution mechanism. Nonperformance must be based on all information on fully settled disputes or litigation, i.e. dispute or litigation that has been resolved in accordance with the dispute resolution mechanism under the respective contract and where all appeal instances available to the Bidder have been exhausted.
- <sup>3</sup> This requirement also applies to contracts executed by the Bidder as Joint Venture partner.



and so shall in total not represent more than **fifty percent (50%)** of the Bidder's net worth calculated as the difference between total assets and total liabilities.

**2.2.4 Declaration: Environmental, Health and Safety Past Performance**

Criteria Requirement	Compliance Requirements			Documents Submission Requirements	
	Single Entity	Joint Venture			
		All Partners Combined	Each Partner	One Partner	
Declare any contracts that have been suspended or terminated and/or performance security called by an employer for reasons related to the noncompliance of any environmental, health and safety contractual obligations in the <b>past five years</b> .	Must make the declaration. If the bidder proposes Specialist Subcontractor/s to meet EQC 2.4.2, those Specialist Subcontractor/s must also make the declaration	Not applicable	Each partner must make the declaration. If the bidder proposes Specialist Subcontractor/s to meet EQC 2.4.2, those Specialist Subcontractor/s must also make the declaration	Not applicable	Form CON-2



## 2.3 Financial Situation

### 2.3.1 Historical Financial Performance

Criteria Requirement	Compliance Requirements				Documents Submission Requirements
	Single Entity	Joint Venture			
		All Partners Combined	Each Partner	One Partner	
Submission of audited financial statements or, if not required by the law of the Bidder's country, other financial statements acceptable to the Employer, for the <b>last (03) years</b> i.e. Financial Year 2020-21, 2021-22 & 2022-23 of the bidders which close their accounts on June 30 <sup>th</sup> every year <b>OR</b> Calendar Year 2021, 2022 & 2023 of the bidders which close their accounts on 31 <sup>st</sup> December every year or for the latest three years, applicable to demonstrate the current soundness of the Bidder's financial position As a minimum, the Bidder's net worth for the last year, calculated as the difference between total assets and total liabilities should be <b>positive</b> .	Must meet requirement	Not applicable	Must meet requirement	Not applicable	Form FIN - 1 with attachments

### 2.3.2 Average Annual Construction Turnover

Criteria Requirement	Compliance Requirements				Documents Submission Requirements
	Single Entity	Joint Venture			
		All Partners Combined	Each Partner	One Partner	
Minimum average annual construction turnover calculated as total certified payments received for contracts in progress or completed, within the <b>last three (03) years</b> .	Must meet requirement	Must meet requirement	Must meet <b>30%</b> of the requirement	Must meet <b>50%</b> of the requirement	Form FIN - 2
for Lot-1	PKR 10.30 billion or US\$ 36.80 million				
for Lot-2	PKR 12.50 billion or US\$ 44.65 million				
for Lot-3	PKR 20.71 billion or US\$ 74.00 million				
for Lot-4	PKR 15.70 billion or US\$ 56.10 million				





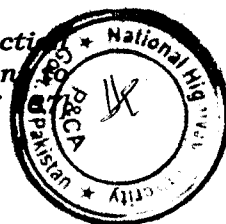
### 2.3.3 Financial Resources

If the bid evaluation process and the decision for the award of the Contract takes more than 1 year from the date of bid submission, Bidders may 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, will be reassessed on this basis.

Criteria Requirement	Compliance Requirements				Documents								
	Single Entity	Joint Venture			Submission Requirements								
		All Partners Combined	Each Partner	One Partner									
<p><b>For Single Entities</b> The Bidder must demonstrate that its financial resources defined in FIN-3, less its financial obligations for its current contract commitments defined in FIN-4, meet or exceed the total requirement for the following lots:</p> <table border="1"> <tr> <td>for Lot-1</td> <td>PKR 2,300.0 million or US\$ 8.22 million</td> </tr> <tr> <td>for Lot-2</td> <td>PKR 2,763.0 million or US\$ 9.90 million</td> </tr> <tr> <td>for Lot-3</td> <td>PKR 4,602.0 million or US\$ 16.50 million</td> </tr> <tr> <td>for Lot-4</td> <td>PKR 3,500.0 million or US\$ 12.50 million</td> </tr> </table>	for Lot-1	PKR 2,300.0 million or US\$ 8.22 million	for Lot-2	PKR 2,763.0 million or US\$ 9.90 million	for Lot-3	PKR 4,602.0 million or US\$ 16.50 million	for Lot-4	PKR 3,500.0 million or US\$ 12.50 million	must meet requirement	not applicable	not applicable	not applicable	<p>Form FIN – 3 and Form FIN – 4</p> <p>If the Bidder intends to utilize a line of credit to fulfill the financial resources requirement, the Bidder must obtain a letter of line of credit from a recognized bank. The letter must be: (i) addressed to the Client; (ii) shall be issued within last 02 month; (iii) it should be unconditional; and (iv) credit line must be valid and available (specifying remaining balance of credit) to the bidder for the complete Time for Completion of the Project).</p> <p>Separate / specific letters should be submitted for respective lot, in case a bidder is submitting bids for multiple lots.</p>
for Lot-1	PKR 2,300.0 million or US\$ 8.22 million												
for Lot-2	PKR 2,763.0 million or US\$ 9.90 million												
for Lot-3	PKR 4,602.0 million or US\$ 16.50 million												
for Lot-4	PKR 3,500.0 million or US\$ 12.50 million												
<p><b>For Joint Ventures</b> (1) One partner must demonstrate that its financial resources defined in FIN-3, less its financial obligations for its own current contract commitments defined in FIN-4, meet or exceed its required share from the total requirement for the following lots.</p> <table border="1"> <tr> <td>for Lot-1</td> <td>PKR 920.0 million or US\$ 3.30 million</td> </tr> <tr> <td>for Lot-2</td> <td>PKR 1,105.0 million or US\$ 3.95 million</td> </tr> <tr> <td>for Lot-3</td> <td>PKR 1,841.0 million or US\$ 6.60 million</td> </tr> </table>	for Lot-1	PKR 920.0 million or US\$ 3.30 million	for Lot-2	PKR 1,105.0 million or US\$ 3.95 million	for Lot-3	PKR 1,841.0 million or US\$ 6.60 million	not applicable	not applicable	not applicable	must meet requirement	<p>Form FIN – 3 and Form FIN – 4</p> <p>If the Bidder intends to utilize a line of credit to fulfill the financial resources requirement, the Bidder must obtain a letter of line of credit from a recognized bank. The letter must be: (i) addressed to the Client; (ii) shall be issued within last 02 month; (iii) it should be unconditional; and (iv) credit line must be valid and available (specifying remaining balance</p>		
for Lot-1	PKR 920.0 million or US\$ 3.30 million												
for Lot-2	PKR 1,105.0 million or US\$ 3.95 million												
for Lot-3	PKR 1,841.0 million or US\$ 6.60 million												



Criteria		Compliance Requirements			Documents
Requirement	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	
<p>for Lot-4 <b>PKR 1,400.0 million or US\$ 5.00 million</b></p> <p>AND</p>					<p>of credit) to the bidder for the complete Time for Completion of the Project).</p> <p>Separate / specific letters should be submitted for respective lot, in case a bidder is submitting bids for multiple lots.</p>
<p>(2) Each partner must demonstrate that its financial resources defined in FIN - 3, less its financial obligations for its own current contract commitments defined in FIN - 4, meet or exceed its required from the total requirement for the following lots.</p> <p>for Lot-1 <b>PKR 575.0 million or US\$ 2.10 million</b></p> <p>for Lot-2 <b>PKR 691.0 million or US\$ 2.50 million</b></p> <p>for Lot-3 <b>PKR 1,151.0 million or US\$ 4.10 million</b></p> <p>for Lot-4 <b>PKR 875.0 million or US\$ 3.13 million</b></p> <p>AND</p>	not applicable	not applicable	must meet requirement	not applicable	<p>Form FIN - 3 and Form FIN - 4</p> <p>If the Bidder intends to utilize a line of credit to fulfill the financial resources requirement, the Bidder must obtain a letter of line of credit from a recognized bank. The letter must be: (i) addressed to the Client; (ii) shall be issued within last 02 month; (iii) it should be unconditional; and (iv) credit line must be valid and available (specifying remaining balance of credit) to the bidder for the complete Time for Completion of the Project).</p> <p>Separate / specific letters should be submitted for respective lot, in case a bidder is submitting bids for multiple lots.</p>
<p>(3) The Joint Venture must demonstrate that the combined financial resources of all partners defined in FIN-3, less all the partners' total financial obligations for the current contract commitments defined in FIN-4, meet or exceed the total requirement for the following lots:</p> <p>for Lot-1 <b>PKR 2,300.0 million or US\$ 8.22 million</b></p> <p>for Lot-2 <b>PKR 2,763.0 million or US\$ 9.90 million</b></p>	not applicable	must meet requirement	not applicable	not applicable	<p>Form FIN - 3 and Form FIN - 4</p> <p>If the Bidder intends to utilize a line of credit to fulfill the financial resources requirement, the Bidder must obtain a letter of line of credit from a recognized bank. The letter must be: (i) addressed to the Client; (ii) shall be issued within last 02 month; (iii) it should be unconditional; and (iv) credit line must be valid and available</p>



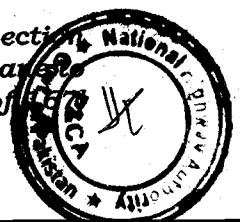
Criteria		Compliance Requirements			Documents	
Requirement		Single Entity	Joint Venture			Submission Requirements
			All Partners Combined	Each Partner	One Partner	
for Lot-3	PKR 4,602.0 million or US\$ 16.50 million					(specifying remaining balance of credit) to the bidder for the complete Time for Completion of the Project).  Separate / specific letters should be submitted for respective lot, in case a bidder is submitting bids for multiple lots.
for Lot-4	PKR 3,500.0 million or US\$ 12.50 million					



## 2.4 Construction Experience

### 2.4.1 Contracts of Similar Size and Nature

Criteria Requirement	Compliance Requirements				Documents Submission Requirements								
	Single Entity	Joint Venture											
		All Partners Combined	Each Partner	One Partner									
<p>Participation as a contractor, Joint Venture partner, or Subcontractor, in at least <b>one contract</b> that has been satisfactorily and substantially completed within the <b>last seven (07) years</b> and that is similar to the proposed works, where the value of the Bidder's participation exceeds amounts mentioned below. The similarity of the Bidder's participation shall be based on:</p> <ol style="list-style-type: none"> <li>1. the physical size</li> <li>2. nature of works</li> <li>3. complexity, methods</li> <li>4. technology or</li> <li>5. other characteristics</li> </ol> <p>as described in Section 6, Employer's Requirements</p> <table border="1"> <tr> <td>for Lot-1</td> <td>PKR 11.0 billion or US\$ 39.20 million</td> </tr> <tr> <td>for Lot-2</td> <td>PKR 13.30 billion or US\$ 47.40 million</td> </tr> <tr> <td>for Lot-3</td> <td>PKR 22.10 billion or US\$ 79.0 million</td> </tr> <tr> <td>for Lot-4</td> <td>PKR 16.80 billion or US\$ 60.0 million</td> </tr> </table>	for Lot-1	PKR 11.0 billion or US\$ 39.20 million	for Lot-2	PKR 13.30 billion or US\$ 47.40 million	for Lot-3	PKR 22.10 billion or US\$ 79.0 million	for Lot-4	PKR 16.80 billion or US\$ 60.0 million	Must meet requirement	Not Applicable	Not Applicable	Must meet requirement	<p>Form EXP-1</p> <p>In addition to the submission requirement Form EXP-1, Bidders shall provide the following supporting documents:</p> <ol style="list-style-type: none"> <li>1. Signed Contract Agreement, and</li> <li>2. Taking-Over Certificate, Contract Completion Certificate or Performance Certificate (and, if necessary, any additional documents certified by the Employer of the concerned contract, as acceptable to the Employer), in sufficient detail to verify the contract name, value, completion time (or substantial completion), and all requirement for similarity. If the documents are other than in English, an accurate certified translation of these documents in English shall be provided.</li> </ol> <p>For contracts under which the Bidder participated as a Joint Venture partner or Subcontractor, only the Bidder's respective share, by value, shall be considered to meet this requirement. The Bidders are required to complete Form EXP-1, indicating</p>
for Lot-1	PKR 11.0 billion or US\$ 39.20 million												
for Lot-2	PKR 13.30 billion or US\$ 47.40 million												
for Lot-3	PKR 22.10 billion or US\$ 79.0 million												
for Lot-4	PKR 16.80 billion or US\$ 60.0 million												



					<p>both the percentage and amount of their participation in the total contract amount. For contracts implemented by Joint Venture Contractor, if the bidder comprises the same Joint Venture, the 'Single Entity' requirements will apply. Additionally, they may be required to provide relevant details, such as joint venture (JV) or subcontract agreements, Engineer's approval of subcontractor, payment receipts etc.</p> <p><b>Note:</b> The Employer will consider a "satisfactorily and substantially completed contract" as one for which Taking Over Certificate, Contract Completion Certificate or Performance Certificate (or equivalent) as acceptable by the Employer) was issued by the Employer of the concerned contract.</p>
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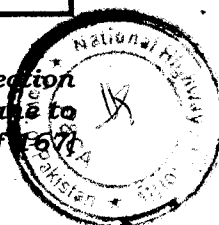


## 2.4.2 Construction Experience in Key Activities

2.4.2 (a) Must be complied with by the Bidder. In case of a Joint Venture Bidder, the Bidder or at least one of the partners must meet the requirement in the key activity. For contracts under which the Bidder participated as a Joint Venture partner, only the Bidder's designated scope of works under the contracts shall be considered to meet this requirement.

**Table A**

Criteria Requirement	Compliance Requirements		Documents
	Single Entity	Joint Venture	Submission Requirements
For the above or other contracts executed during the period stipulated in 2.4.1, a minimum construction experience is required in the following key activities:	Must meet requirement	Must meet requirement	Form EXP-2 Form EXP-2 shall be supported by documents such as Signed Contract Agreement, Taking-Over Certificate or Contract Completion Certificate indicating the contract name, value, completion date (or percentage of substantial completion), activities performed by Joint Venture partners, certified payments showing activity details, and other relevant details sufficient to demonstrate compliance with the requirements
<b>Lot-1: Rajanpur – Jampur Section (57.50 Km)</b>			
Embankment 1,875,190 Cu.m/ in any one year	Must meet requirement	Must meet requirement	As Above.
Base / Sub-Base 313,235 m/ in any one year			
Asphaltic Concrete Pavement 101,435 Cu.m/ in any one year			
Concrete (for major and minor roads structures) 31,167 Cu.m/ in any one year			
<b>Lot-2: Jampur – DG Khan Section (64.0 Km)</b>			
Embankment 2,330,000 Cu.m/ in any one year	Must meet requirement	Must meet requirement	As Above.
Base / Sub-Base 328,300 m/ in any one year			
Asphaltic Concrete Pavement 110,000 Cu.m/ in any one year			
Concrete (for major and minor roads structures) 49,100 Cu.m/ in any one year			
<b>Lot-3: DG Khan to Tibi Qaisrani via Shahdan Lund Section (111.70 Km)</b>			
Embankment 2,5889,200 Cu.m/ in any one year	Must meet requirement	Must meet requirement	As Above.
Base / Sub-Base			



Criteria Requirement	Compliance Requirements		Documents
	Single Entity	Joint Venture	Submission Requirements
576,600 m/ in any one year			
Asphaltic Concrete Pavement 175,140 Cu.m/ in any one year			
Concrete (for major and minor roads structures) 98,500 Cu.m/ in any one year			
<b>Lot- 4: Tibi Qaisrani to DI Khan via Ramak Section (96.245 Km)</b>			
Embankment 1,076,000 Cu.m/ in any one year	Must meet requirement	Must meet requirement	As Above.
Base / Sub-Base 437,900 m/ in any one year			
Asphaltic Concrete Pavement 149,600 Cu.m/ in any one year			
Concrete (for major and minor roads structures) 79,300 Cu.m/ in any one year			

2.4.2. (b) The Employer accepts any of the following activities to be subcontracted. They may be complied with by the Bidder or by its proposed Specialist Subcontractor.

If the key activity is to be undertaken by a Specialist Subcontractor, the Employer shall require evidence of the subcontracting agreement from the Bidder.



**Table B**

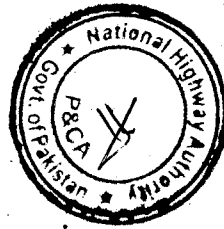
Criteria Requirement	Compliance Requirements		Documents
	Single Entity or Its Specialist Subcontractors	Joint Venture or Its Specialist Subcontractors	Submission Requirements
For the above or other contracts executed during the period stipulated in 2.4.1, a minimum construction experience is required in the following key activities:	Must meet requirement	Must meet requirement	Form P-2
<b>Lot-1: Rajanpur – Jampur Section (57.50 Km)</b>			
	Must meet requirement	Must meet requirement	
<b>Lot-2: Jampur – DG Khan Section (64.0 Km)</b>			
	Must meet requirement	Must meet requirement	
<b>Lot-3: DG Khan to Tibi Qaisrani via Shahdan Lund Section (111.70 Km)</b>			
	Must meet requirement	Must meet requirement	
<b>Lot-4: Tibi Qaisrani to DI Khan via Ramak Section (96.245 Km)</b>			
	Must meet requirement	Must meet requirement	





**2.4.3 Specific Experience in Managing Environmental, Health and Safety Aspects**

Criteria	Compliance Requirements		Documents
	Requirement	Single Entity or Its Specialist Subcontractors	Joint Venture or Its Specialist Subcontractors
<p>For the contracts in 4.1 and 4.2 above and/or any other contracts [substantially completed and under implementation] as prime contractor, Joint Venture partner, or Subcontractor between <b>1<sup>st</sup> July 2018</b> and Bid submission deadline, experience in managing EHS risks and impacts in the following aspects:</p> <ul style="list-style-type: none"> <li>- Traffic management practice</li> <li>- Local cultural heritage protection practice</li> <li>- Work at height and fall protection.</li> <li>- Control of infectious and communicable diseases (HIV/AIDS, malaria, COVID-19 etc</li> </ul>	<p>Must meet requirements.</p>	<p>One member must meet requirements.</p>	<p>Form EXP-3</p>



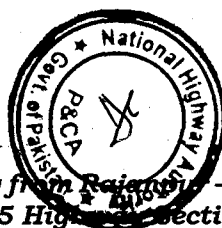
## 2.5 Organizational Environmental, Health and Safety System

### 2.5.1 Environmental, Health and Safety Certification

Criteria Requirement	Compliance Requirements		Documents
	Single Entity or Its Specialist Subcontractors	Joint Venture or Its Specialist Subcontractors	Submission Requirements
<p>Availability of a valid ISO certification or internationally recognized equivalent (equivalency to be demonstrated by the Bidder), and applicable to the worksite:</p> <ol style="list-style-type: none"> <li>1) Quality management certificate <b>ISO 9001</b> (or internationally recognized equivalent).</li> <li>2) Environmental management certificate <b>ISO 14001</b> (or internationally recognized equivalent).</li> <li>3) Health and Safety management certificate <b>ISO 45001</b> (or internationally recognized equivalent).</li> </ol>	Must meet requirements.	One member must meet requirements.	Form EXP-4

### 2.5.2 Environmental, Health and Safety Documentation

Criteria Requirement	Compliance Requirements		Documents
	Single Entity or Its Specialist Subcontractors	Joint Venture or Its Specialist Subcontractors	Submission Requirements
<p>Availability of in-house policies and procedures for EHS management:</p> <ol style="list-style-type: none"> <li>1. Existence of an Ethics Charter</li> <li>2. Existence of a system for monitoring compliance with EHS commitments for the Bidder's Subcontractors and all its partners.</li> <li>3. Existence of official company procedures for the management of the following: <ul style="list-style-type: none"> <li>➤ EHS resources and facilities and EHS monitoring system.</li> <li>➤ Project Areas management information (base camps, quarries, burrow pits, storage areas).</li> <li>➤ Health and Safety on worksites policy and related guidance.</li> </ul> </li> </ol>	Must meet requirements.	One member must meet requirements.	Form EXP-5



### 2.5.3 Environmental, Health and Safety Dedicated Personnel

Criteria Requirement	Compliance Requirements		Documents
	Single Entity or Its Specialist Subcontractors	Joint Venture or Its Specialist Subcontractors	Submission Requirements
Availability of in-house personnel dedicated to EHS issues:  1. Environmental Specialist 2. Occupational Health and Safety Specialist	Must meet requirements	One member must meet requirements	Form EXP-6



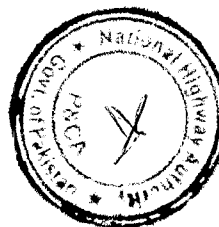
# Section 4: Bidding Forms

## - Without Prequalification -

This section contains the forms to be completed by the Bidder and submitted as part of its Bid.

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# Letter of Technical Bid

**Note**

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

Date: \_\_\_\_\_

OCB No.: OCB/CAREC/T-III

Invitation for Bid No.: OCB/CAREC/T-III

To:

**General Manager (P&CA)  
National Highway Authority  
28-Mauve Area, Sector: G-9/1  
2<sup>nd</sup> Floor, Room No. 223  
City: Islamabad  
ZIP Code: 44000  
Country: Pakistan  
Telephone: 00-92-51-9032727  
Fax: 00-92-51-9260419  
E-mail: gmpca.nha@gmail.com & gmpca@nha.gov.pk**

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) 8.
- (b) We acknowledge that we have read and understand ADB's Anticorruption Policy (1998) and Integrity Principles and Guidelines (2015), both as amended from time to time.
- (c) We offer to execute in conformity with the Bidding Documents the following Works:

**Construction of Additional Carriageway from Rajanpur – DG Khan N55 Highway Section (121.5 Km) and DG Khan – DI Khan N55 Highway Section (208.0 Km) from Two-Lane to Four-Lane**

- Lot-1: Rajanpur – Jampur Section (57.50 Km)
- Lot-2: Jampur – DG Khan Section (64.0 Km)
- Lot-3: DG Khan to Tibi Qaisrani via Shahdan Lund Section (111.70 Km)
- Lot-4: Tibi Qaisrani to DI Khan via Ramak Section (96.245 Km)

**[Select the Lot(s) for which you apply and delete the others]**

- (d) Our Bid consisting of the Technical Bid and the Price Bid shall be valid for a period of **one hundred and eighty (180)** days starts from the date fixed for the bid submission deadline in accordance with ITB 22.1, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
- (e) Our firm, including any Subcontractors or Suppliers for any part of the Contract, have nationalities from eligible countries in accordance with ITB 4.2.

**Construction of Additional Carriageway from Rajanpur – DG Khan N55 Highway Section (121.5 Km) and DG Khan – DI Khan N55 Highway Section (208.0 Km) from Two-Lane to Four-Lane – [Lot-1, Lot-2, Lot-3 and Lot-4]**

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- (f) We, our directors, key officers, key personnel, including any Subcontractors, consultants, subconsultants, manufacturers, service providers or Suppliers for any part of the contract, do not have any conflict of interest in accordance with ITB 4.3.

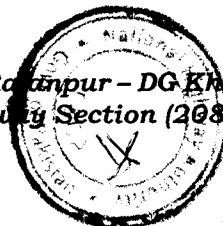
If there is any conflict of interest, please state details:

- (i) Parties involved in the conflict of interest: \_\_\_\_\_
- (ii) Details about the conflict of interest: \_\_\_\_\_
- (g) We are not participating, as a Bidder, either individually or as partner in a Joint Venture, 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.
- (h) Our firm, Joint Venture partners, our respective direct and indirect shareholders, directors, key officers, key personnel, associates, parent company, affiliates or subsidiaries, including any Subcontractors, consultants, subconsultants, manufacturers, service providers or Suppliers for any part of the contract, are not subject to, or not controlled by any entity or individual that is subject to, a temporary suspension or a debarment imposed by the Asian Development Bank or a debarment imposed by the Asian Development Bank in accordance with the Agreement for Mutual Enforcement of Debarment Decisions between the Asian Development Bank and other development banks.<sup>4</sup>
- (i) We have checked all the parties mentioned in the declaration above against ADB's published sanctions list accessed via <https://www.adb.org/who-we-are/integrity/sanctions>.
- (j) Our firm, Joint Venture partners, our respective direct and indirect shareholders, directors, key officers, key personnel, associates, parent company, affiliates or subsidiaries, including any Subcontractors, consultants, subconsultants, manufacturers, service providers or Suppliers for any part of the contract, are not under ongoing investigation and/or sanctions proceedings by the Asian Development Bank or any multilateral development bank.

If under ongoing investigation and/or sanctions proceedings by the Asian Development Bank or any multilateral development bank, please state details:

- (i) Name of the multilateral development bank: \_\_\_\_\_
- (ii) Reason for the ongoing investigation / allegations: \_\_\_\_\_
- (k) Our firm, Joint Venture partners, our respective direct and indirect shareholders, directors, key officers, key personnel, associates, parent company, affiliates or subsidiaries, including any Subcontractors, consultants, subconsultants, manufacturers, service providers or Suppliers for any part of the Contract, are not

<sup>4</sup> These institutions include African Development Bank, European Bank for Reconstruction and Development, Inter-American Development Bank, and the World Bank Group. According to paragraph 9 of the Agreement, other international financial institutions may join upon the consent of all Participating Institutions and signature of a Letter of Adherence by the international financial institution substantially in the form provided (Annex B to the Agreement). Upon adherence, such international financial institution shall become a Participating Institution for purposes of the Agreement. Bidders are advised to check [www.adb.org/integrity](http://www.adb.org/integrity) for updates.



temporarily suspended, debarred, declared ineligible, or subject to any national and/or international sanctions by any country, any international organization, any multilateral development bank and other donor agency.

If so temporarily suspended, debarred, declared ineligible, or subject to any national and/or international sanctions by any country, any international organization, any multilateral development bank and other donor agency, please state details (as applicable to each Joint Venture partner, their respective direct or indirect shareholders, directors, key officers, key personnel, associate, parent company, affiliate, subsidiaries, Subcontractors, consultants, subconsultants, manufacturers, service providers and/or Suppliers):

- (i) Name of Institution: \_\_\_\_\_
- (ii) Period of the temporary suspension, debarment, ineligibility, or national or international sanction [start and end date]: \_\_\_\_\_
- (iii) Reason for the temporary suspension, debarment, ineligibility, or national or international sanction: \_\_\_\_\_

- (l) Our firm, Joint Venture partners, associates, parent company, affiliates or subsidiaries, including any Subcontractors, consultants, subconsultants, manufacturers, service providers, Suppliers, key officers, directors and key personnel have never been charged or convicted with any criminal offense (including felonies but excluding misdemeanors) or infractions and/or violations of ordinance; nor charged or found liable in any civil or administrative proceedings in the last 10 years; or undergoing investigation for such, or subject to any criminal, civil or administrative orders, monitorship or enforcement actions.

If so charged, convicted/found liable, under ongoing investigation, or subject to orders, monitorship or enforcement actions, please state details:

- (i) Nature of the offense, violation, proceedings, investigation, and/or monitorship or enforcement actions: \_\_\_\_\_
- (ii) Court, area of jurisdiction and/or the enforcement agency: \_\_\_\_\_
- (iii) Resolution [i.e. dismissed; settled; or convicted/duration of penalty]: \_\_\_\_\_
- (iv) Other relevant details [please specify]: \_\_\_\_\_

- (m) Our firm, Joint Venture partners, our respective direct and indirect shareholders, directors, key officers, key personnel, associates, affiliates or subsidiaries, including any Subcontractors, consultants, subconsultants, manufacturers, service providers or Suppliers, can make and receive payments through the international banking system or otherwise discharge the Employer's obligation upon initiation of wire transfer.

If unable to make or receive funds through the international banking system or otherwise discharge the Employer's obligation upon initiation of wire transfer, please state the details:

- (i) Nature of the restriction: \_\_\_\_\_
- (ii) Jurisdiction of the restriction: \_\_\_\_\_
- (iii) Other relevant details: \_\_\_\_\_



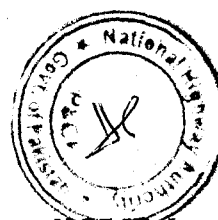
- (n) Our firm, Joint Venture partners, associates, parent company, affiliates or subsidiaries, including any Subcontractors, consultants, subconsultants, manufacturers, service providers or Suppliers, key officers, directors and key personnel are not from a country which is prohibited to export goods or services to, or receive any payments from the Employer's country and/or are not prohibited to receive payments for particular goods or services by the Employer's country 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.
- (o) We have paid, or will pay the following commissions, gratuities, or fees with respect to the bidding process or execution of the Contract.<sup>5</sup>

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

- (p) We understand that it is our obligation to notify the Employer of any changes in connection with the matters described in paragraphs (f), (h), (j), (k), (l), (m), (n) and (o) of this Letter of Technical Bid.
- (q) [We are not a government-owned enterprise] / [We are a government-owned enterprise but meet the requirements of ITB 4.5].<sup>6</sup>
- (r) We have not been suspended nor declared ineligible by the Employer based on execution of a Bid-Securing Declaration in accordance with ITB 4.6.
- (s) At any time following submission of our Bid, we shall permit, and shall cause our Joint Venture partners, directors, key officers, key personnel, associates, parent company, affiliates or subsidiaries, including any Subcontractors, consultants, subconsultants, manufacturers, service providers or Suppliers for any part of the contract to permit ADB or its representative to inspect our site, assets, accounts and records and other documents relating to the bid submission and to have them audited by auditors appointed by ADB. We understand that failure of this obligation may constitute obstructive practice that may result in debarment and/or contract termination.
- (t) Regardless of whether the contract will be awarded to us, we shall preserve all accounts, records and other documents related to bid submission for at least 3 years from the date of submission of the bid or the period prescribed in applicable law, whichever is longer.
- (u) If we are awarded the contract, we shall preserve all accounts, records and other documents related to the procurement and execution of the contract for at least 5 years after completing the works contemplated in the relevant contracts or the period prescribed in applicable law, whichever is longer.

<sup>5</sup> If none has been paid or is to be paid, indicate "None".

<sup>6</sup> Use one of the two options as appropriate.





- (v) If our Bid is accepted, we commit to mobilizing key equipment and personnel in accordance with the requirements set forth in Section 6 (Works' Requirements) and our technical proposal, or as otherwise agreed with the Employer.
  
- (w) We certify on behalf of the Bidder, that the information provided in the bid has been fully reviewed, given in good faith, and to the best of our knowledge is true and complete. We understand that it is our obligation to inform the Employer of any changes to the information as and when it becomes known to us. We understand that any misrepresentation that knowingly or recklessly misleads, or attempts to mislead may lead to the automatic rejection of the Bid or cancellation of the contract, if awarded; and may result in remedial actions, in accordance with ADB's Anticorruption Policy (1998, as amended to date) and Integrity Principles and Guidelines (2015, as amended from time to time).

Name .....[insert complete name of person signing the bid]

In the capacity of .....[insert legal capacity of person signing the bid]

Signed .....[insert signature of person whose name and capacity are shown above]

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

Date .....[insert date of signing]



# Letter of Price Bid

**Note**

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

Date: \_\_\_\_\_

OCB No.: OCB/CAREC/T-III

Invitation for Bid No.: OCB/CAREC/T-III

To:

**General Manager (P&CA)  
National Highway Authority  
28-Mauve Area, Sector: G-9/1  
2<sup>nd</sup> Floor, Room No. 223  
City: Islamabad  
ZIP Code: 44000  
Country: Pakistan  
Telephone: 00-92-51-9032727  
Fax: 00-92-51-9260419  
E-mail: gmpca.nha@gmail.com & gmpca@nha.gov.pk**

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) 8.
- (b) We acknowledge that we have read and understand ADB's Anticorruption Policy (1998) and Integrity Principles and Guidelines (2015), both as amended from time to time.
- (c) We offer to execute in conformity with the Bidding Documents and the Technical Bid submitted for the following Works:  
**Construction of Additional Carriageway from Rajanpur – DG Khan N55 Highway Section (121.5 Km) and DG Khan – DI Khan N55 Highway Section (208.0 Km) from Two-Lane to Four-Lane**  
➤ Lot-1: Rajanpur – Jampur Section (57.50 Km)  
➤ Lot-2: Jampur – DG Khan Section (64.0 Km)  
➤ Lot-3: DG Khan to Tibi Qaisrani via Shahdan Lund Section (111.70 Km)  
➤ Lot-4: Tibi Qaisrani to DI Khan via Ramak Section (96.245 Km)

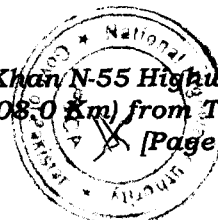
**[Select the Lot(s) for which you apply and delete the others.]**

- (d) The total price of our Bid, excluding any discounts offered in item (d) below is:

[amount of foreign currency in words], [amount in figures], and [amount of local currency in words], [amount in figures]

The total bid price from the Summary of Bill of Quantities should be entered by the bidder inside this box. Absence of the total bid price in the Letter of Price Bid may result in the rejection of the bid.

**Construction of Additional Carriageway from Rajanpur – DG Khan N55 Highway Section (121.5 Km) and DG Khan – DI Khan N55 Highway Section (208.0 Km) from Two-Lane to Four-Lane – [Lot-1, Lot-2, Lot-3 and Lot-4]**



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- (e) The discounts offered and the methodology for their application are: [insert discounts and methodology for their application if any]
- (f) Our Bid shall be valid for a period of **one hundred and eighty (180)** days starts from the date fixed for the bid submission deadline in accordance with ITB 22.1, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
- (g) If our Bid is accepted, we commit to obtain a performance security in accordance with the Bidding Documents.
- (h) We understand that this bid, together with your written acceptance thereof included in your notification of award through the issuance of Letter of Acceptance, 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.
- (j) At any time following submission of our Bid, we shall permit, and shall cause our Joint Venture partners, directors, key officers, key personnel, associates, parent company, affiliates or subsidiaries, including any Subcontractors, consultants, subconsultants, manufacturers, service providers or Suppliers for any part of the contract to permit ADB or its representative to inspect our site, assets, accounts and records and other documents relating to the bid submission and to have them audited by auditors appointed by ADB. We understand that failure of this obligation may constitute obstructive practice that may result in debarment and/or contract termination.
- (k) Regardless of whether the contract will be awarded to us, we shall preserve all accounts, records and other documents related to bid submission for at least 3 years from the date of submission of the bid or the period prescribed in applicable law, whichever is longer.
- (l) If we are awarded the contract, we shall preserve all accounts, records and other documents related to the procurement and execution of the contract for at least 5 years after completing the works contemplated in the relevant contracts or the period prescribed in applicable law, whichever is longer.
- (m) We confirm and stand by our commitments and other declarations made in connection with the submission of our Letter of Technical Bid.
- (n) We certify on behalf of the Bidder, that the information provided in the bid has been fully reviewed, given in good faith, and to the best of our knowledge is true and complete. We understand that it is our obligation to inform the Employer of any changes to the information as and when it becomes known to us. We understand that any misrepresentation that knowingly or recklessly misleads, or attempts to mislead may lead to the automatic rejection of the Bid or cancellation of the contract, if awarded; and may result in remedial actions, in accordance with ADB's Anticorruption Policy (1998, as amended to date) and Integrity Principles and Guidelines (2015, as amended from time to time).



Name .....[insert complete name of person signing the bid]  
In the capacity of .....[insert legal capacity of person signing the bid]  
Signed ..... [insert signature of person whose name and capacity are shown above]  
Duly authorized to sign the Bid for and on behalf of .....  
Date .....[insert date of signing]



# Bid Security Bank Guarantee

[Bank's name, and address of issuing branch or office]<sup>7</sup>

**Beneficiary:** .....[Name and address of the Employer].....

**Date:** .....

**Bid Security No.:** .....

We have been informed that [name of the Bidder] (hereinafter called "the Bidder") has submitted to you its bid dated [please specify] (hereinafter called "the Bid") for the execution of [name of contract] under Invitation for Bids No. [please specify] ("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 words] [amount in figures] 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

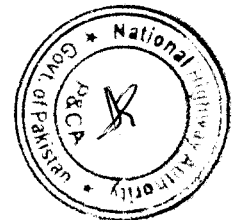
- (a) has withdrawn its Bid during the period of bid validity specified by the Bidder in the Letter of Bid; or
- (b) does not accept the correction of errors in accordance with the Instructions to Bidders (hereinafter "the ITB"); or
- (c) having been notified of the acceptance of its Bid by the Employer 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, or (iii) fails or refuses to furnish a domestic preference security, if required.

This guarantee will expire (a) if the Bidder is the successful Bidder, upon our receipt of copies of the Contract Agreement signed by the Bidder and the Performance Security issued to you upon the instruction of the Bidder; or (b) if the Bidder is not the successful Bidder, upon the earlier of (i) our receipt of a copy of your notification to the Bidder of the name of the successful Bidder, or (ii) 28 days after the expiration of the Bidder's bid.

Consequently, any demand for payment under this guarantee must be received by us at the office indicated above on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758.

.....  
[Authorized signature(s) and bank's seal (where appropriate)]



<sup>7</sup> All italicized text is for use in preparing this form and shall be deleted from the final document.

# Bid-Securing Declaration

**Date:** [insert date (as day, month and year)]

**Bid No.:** [insert number of bidding process]

**Alternative No.:** [insert identification No if this is a bid for an alternative]

**To:** [insert complete name of the Employer]

We, the undersigned, declare that:

We understand that, according to your conditions, Bids may be supported by a Bid-Securing Declaration.

We accept that we will automatically be suspended from being eligible for bidding in any contract with the Borrower for the period of time of 5 years starting on the date that we receive a notification from the Employer, if we are in breach of our obligation(s) under the bid conditions, because we

- (a) have withdrawn our bid during the period of bid validity specified in the Letter of Bid; or
- (b) do not accept the correction of errors in accordance with the Instructions to Bidders (hereinafter "the ITB"); or
- (c) having been notified of the acceptance of our Bid by the Employer during the period of bid validity, (i) fail or refuse to execute the Contract, if required; or (ii) fail or refuse to furnish the Performance Security, in accordance with the ITB; or (iii) fail or refuse to furnish a domestic preference security, if required.

We understand this Bid-Securing Declaration shall expire if we are not the successful Bidder, upon the earlier of (i) our receipt of your notification to us of the name of the successful Bidder; or (ii) 28 days after the expiration of our Bid.

Signed: [insert signature of person whose name and capacity are shown]

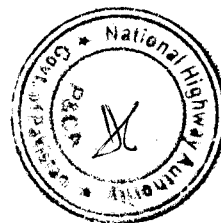
In the capacity of [insert legal capacity of person signing the Bid-Securing Declaration]

Name: [insert complete name of person signing the Bid-Securing Declaration]

Duly authorized to sign the bid for and on behalf of [insert complete name of the Bidder]

Dated on \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_ [insert date of signing]

Corporate Seal [where appropriate]



# Affiliate Company Guarantee

Name of Contract/Contract No.: \_\_\_\_\_

Name and Address of Employer: \_\_\_\_\_

[together with successors and assigns].

We have been informed that [name of Contractor] (hereinafter called the "Contractor") is submitting an offer for the above-referenced Contract in response to your invitation, and that the conditions of your invitation require its offer to be supported by an affiliate company guarantee.

In consideration of you, the Employer, awarding the Contract to the Contractor we [name of affiliated company] irrevocably and unconditionally guarantee to you our primary obligation, that (i) throughout the duration of the Contract, we will make available to the Contractor our financial, technical capacity, expertise and resources required for the Contractor's satisfactory performance of the Contract; and (ii) we are fully committed, along with the Contractor, to ensuring a satisfactory performance of the Contract.

If the Contractor fails to so perform its obligations and liabilities and comply with the Contract, we will indemnify the Employer against and firm all damages, losses and expenses (including legal fees and expenses) which arise from any such failure for which the Contractor is liable to the Employer under the Contract.

This guarantee shall come into full force and effect when the Contract comes into full force and effect. If the Contract does not come into full force and effect within a year of the date of this guarantee, or if you demonstrate that you do not intend to enter into the Contract with the Contractor, this guarantee shall be void and ineffective. This guarantee shall continue in full force and effect until all the Contractor's obligations and liabilities under the Contract have been discharged. When this guarantee shall expire and shall be returned to us, and our liability hereunder shall be discharged absolutely.

This guarantee shall apply and be supplemental to the Contract as amended or varied by the Employer and the Contractor from time to time. We hereby authorize them to agree on any such amendment or variation, the due performance of which and compliance with which by the Contractor are likewise guaranteed hereunder. Our obligations and liabilities under this guarantee shall not be discharged by any allowance of time or other indulgence whatsoever by the Employer to the Contractor, or by any variation or suspension of the works to be executed under the Contract, or by any amendments to the Contract or to the constitution of the Contractor or the Employer, or by any other matters, whether with or without our knowledge or consent.

This guarantee shall be governed by the law of the same country (or other jurisdiction) that governs the Contract and any dispute under this guarantee shall be finally settled under the [Rules or Arbitration provided in the Contract]. We confirm that the benefit of this guarantee may be assigned subject only to the provisions for assignment of the Contract.

Signed by: ..... Signed by: .....

[signature]

[signature]

[name]

[name]

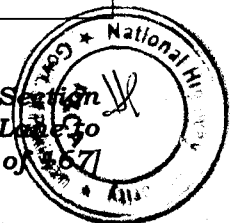
[position in parent/subsidiary company]

[position in parent/subsidiary company]

Date: .....

## NOTE

If permitted in accordance with ITB 32.2 of the BDS, the Bidder shall provide the Affiliate Company Guarantee Form filled out and signed by each subsidiary, parent entity or affiliate that the Bidder submits for consideration of the Employer in determining its qualifications.



# Technical Proposal

**Joint Venture Agreement (in case of JV) in accordance with ITB 11.4**

**Personnel**

**Equipment**

**Site Organization**

**Method Statement**

---

**Mobilization Schedule**

**Construction Schedule**

**Environmental, Health and Safety Management Plan (EHSMP)**

**Environmental, Health and Safety Code of Conduct**

**Other Documents in accordance with ITB 11.2(g) of Section 2-Bid Data Sheet**





## Personnel

### Form PER – 1: Proposed Personnel

Bidder should provide the details of the proposed personnel and their experience record in the relevant Information Forms below for each candidate:

1.	Title of position
	Name
2.	Title of position
	Name
3.	Title of position
	Name
4.	Title of position
	Name
5.	Title of position
	Name
6.	Title of position
	Name
etc.	Title of position
	Name

#### NOTE

All titles of positions will be as listed in Section 6 (Works' Requirements).



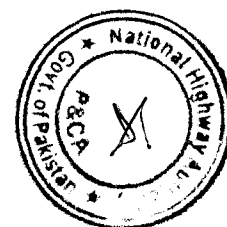
**Form PER – 2: Resumé of Proposed Personnel**

The Bidder shall provide all the information requested below. Use one form for each position.

<b>Position</b>		
<b>Personnel information</b>	<b>Full Legal Name</b>	<b>Date of Birth</b>
	<b>Known as</b>	<b>Place of Birth</b>
	<b>Nationality</b>	<b>Citizenship</b>
	<b>Type of Government ID</b>	<b>ID number</b>
	<b>Attach a copy of ID to this form</b>	
<b>Professional qualifications</b>		
<b>Present employment</b>	<b>Name of employer</b>	
	<b>Address of employer</b>	
	<b>Telephone</b>	<b>Contact (manager / personnel officer)</b>
	<b>Fax</b>	<b>E-mail</b>
	<b>Job title</b>	<b>Years with present employer</b>

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

<b>From</b>	<b>To</b>	<b>Company/Project/Position/Relevant Technical and Management Experience</b>



## Equipment

### Form EQU: Equipment

The Bidder shall provide adequate information and details to demonstrate clearly that it has the capability to meet the equipment requirements indicated in Section 6 (Works' Requirements), using the Forms below. A separate Form shall be prepared for each item of equipment listed, or for alternative equipment proposed by the Bidder.

Item 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
	<input type="checkbox"/> Owned <input type="checkbox"/> Rented <input type="checkbox"/> Leased <input type="checkbox"/> Specially manufactured

Omit the following information for equipment owned by the Bidder.

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



## **Joint Venture Agreement in accordance with ITB 11.4 and detailed description of mutual roles, responsibilities (financial & technical) of both JV Partners.:**

The Joint Venture Agreement or a Letter of Intent to execute a Joint Venture Agreement in the event of the successful Bid, shall include the following:

- (a) All partners shall be jointly and severally liable;
- (b) The lead partner shall be clearly identified and nominated;
- (c) The financial share of each partner shall be clearly stated;
- (d) Corresponding to the financial share of each partner, the roles and responsibilities of each partner shall also be specified in conformance with requirement of Works stated in the Method Statement;
- (e) Management & Decision-making structure: Designate a clear management and decision-making structure within the JV that involves active participation from all partners through regular project meetings of senior management (minimum one per month) to ensure that important decisions are made collectively in a timely manner, and all partners are contributing in the project as per JV Agreement; and
- (f) Any other requirements as per the applicable law.

In case a Letter of Intent to execute a Joint Venture Agreement is submitted by the successful Bidder at the time of submission of the Bid, the Bidder shall be bound to submit a duly executed Joint Venture Agreement to the Employer immediately after the issuance of Letter of Acceptance but not later than 28 days after the issuance of the same. Such Joint Venture Agreement, thus submitted by the successful Bidder must contain the information postulated above. Failure to comply with this condition may lead to the annulment of 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.

### **Site Organization**

**[Note:** Evaluation of the Bidder's Site Organization will include an assessment of the Bidder's capacity to mobilize key 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 6 (Employer's Requirements).]

### **Method Statement**

The bidder **shall** provide detailed Method Statement of executing the project. The bidder shall also indicate the machinery to be used and key personnel showing their responsibilities. In case of a JV, the Method Statement **shall** include clear delineation of activities / roles to be performed by each JV partner consistent with the indicated JV share in the JV Agreement.

### **Mobilization Schedule**

The bidder shall provide graphical (Bar Chart) presentation of its mobilization schedule, harmonized with the Construction Schedule to complete the Works in the stipulated time under the contract (refer Part A- Contract Data under Section-8, Particular Conditions of Contracts). The Mobilization Schedule should reflect the no-objection request and approval step for Site-Specific Environmental, Health and Safety Management Plan as per Contract Conditions. Bidder shall provide mobilization Schedule conforming with the requirement of condition of contract Clause 14.2.

### **Construction Schedule**

**[Note:** Evaluation of the Bidder's Construction Schedule will include an assessment of the Bidder's technical capacity to mobilize equipment 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 6 (Work's Requirements).

*Bidders must provide their Construction Schedule on primavera / MS project or equivalent by allocating the equipment and other resources, critical activities must be identified.]*



**Quarterly Estimate of Progress Payments**

Bidder's estimate of the value of works which would be executed during each quarter based on its method statement, mobilization schedule, construction schedule and the rates in the Bill of Quantities:

Quarter	Amounts (% of Bid Price)
1	_____ %
2	_____ %
3	_____ %
4	_____ %
5	_____ %
.	_____ %
.	_____ %
.	_____ %
.	_____ %
.	_____ %
.	_____ %
.	_____ %
.	_____ %
.	_____ %
.	_____ %
.	_____ %
.	_____ %
.	_____ %
Last quarter	_____ %
<b>Total</b>	<b>100%</b>

**Environmental, Health and Safety Management Plan (EHSMP)**

The Bidder shall submit an outline Environmental, Health and Safety Management Plan (EHSMP) commensurate with the risks and impacts of the proposed works and activities These strategies and plans shall describe in detail the actions, materials, equipment, management processes etc. that will be implemented by the Contractor, and its subcontractors.

In developing these strategies and plans, the Bidder shall have regard to the EHS provisions of the contract and EHS risks including those as may be more fully described in Section 6 (Works' Requirements).



## Environmental, Health and Safety Code of Conduct

### Environmental, Health and Safety Code of Conduct for Contractor's Personnel Form

#### NOTE TO BIDDER

The minimum content of the EHS Code of Conduct form as set out by the Employer shall not be substantially modified. However, the Bidder may add requirements as appropriate, including to take into account Contract-specific issues/risks.

The Bidder shall initial and submit the EHS Code of Conduct form as part of its bid.

### ENVIRONMENTAL, HEALTH AND SAFETY CODE OF CONDUCT FOR CONTRACTOR'S PERSONNEL

We are the Contractor, [enter name of Contractor]. We have signed a contract with [enter name of Employer] for [enter description of the Works]. These Works will be carried out at [enter the Site and other locations where the Works will be carried out]. Our contract requires us to implement measures to address environmental, health and safety risks related to the Works.

This EHS Code of Conduct is part of our measures to deal with environmental, health and safety risks related to the Works. It applies to all our staff, laborers and other employees at the Works Site or other places where the Works are being carried out. It also applies to the personnel of each subcontractor and any other personnel assisting us in the execution of the Works. All such persons are referred to as "**Contractor's Personnel**" and are subject to this EHS Code of Conduct.

This EHS Code of Conduct identifies the behavior that we require from all Contractor's Personnel.

Our workplace is an environment where unsafe, offensive, abusive or violent behavior will not be tolerated and where all persons should feel comfortable raising issues or concerns without fear of retaliation.

#### REQUIRED CONDUCT

Contractor's Personnel shall:

1. carry out his/her duties competently and diligently.
2. comply with this EHS Code of Conduct and all applicable laws, regulations and other requirements, including requirements to protect the health, safety and well-being of other Contractor's Personnel and any other person.
3. maintain a safe working environment including by:
  - (a) ensuring that workplaces, machinery, equipment and processes under each person's control are safe and without risk to health.
  - (b) wearing required personal protective equipment.
  - (c) using appropriate measures relating to chemical, physical and biological substances and agents; and
  - (d) following applicable emergency operating procedures.



4. report work situations that he/she believes are not safe or healthy and remove himself/herself from a work situation which he/she reasonably believes presents an imminent and serious danger to his/her life or health.
5. treat other people with respect, and not discriminate against specific groups such as women, people with disabilities, migrant workers or children.
6. report violations of this EHS Code of Conduct; and
7. not retaliate against any person who reports violations of this EHS Code of Conduct, whether to us or the Employer, or who makes use of the grievance mechanism for Contractor's Personnel or the project's Grievance Redress Mechanism.

### RAISING CONCERNS

If any person observes behavior that he/she believes may represent a violation of this EHS Code of Conduct, or that otherwise concerns him/her, he/she should raise the issue promptly. This can be done by call [ ] to reach the Contractor's hotline (if any) and leave a message.

The person's identity will be kept confidential, unless reporting of allegations is mandated by the country law. Anonymous complaints or allegations may also be submitted and will be given all due and appropriate consideration. We take seriously all reports of possible misconduct and will investigate and take appropriate action. We will provide warm referrals to service providers that may help support the person who experienced the alleged incident, as appropriate.

### CONSEQUENCES OF VIOLATING THE ENVIRONMENTAL, HEALTH AND SAFETY CODE OF CONDUCT

Any violation of this EHS Code of Conduct by Contractor's Personnel may result in serious consequences, up to and including termination of the employment/engagement contract and possible referral to legal authorities.

### FOR CONTRACTOR'S PERSONNEL:

I have received a copy of this EHS Code of Conduct written in a language that I comprehend. I understand that if I have any questions about this EHS Code of Conduct, I can contact [enter name of Contractor's contact person(s) with relevant experience] requesting an explanation.

Name of Contractor's Personnel: [insert name]

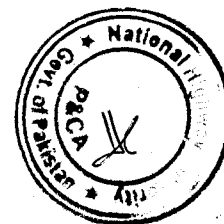
Signature: \_\_\_\_\_

Date: [day month year]: \_\_\_\_\_

Countersignature of authorized representative of the Contractor:

Signature: \_\_\_\_\_

Date: [day month year]: \_\_\_\_\_



## Bidders Qualification

To establish its qualifications to perform the contract in accordance with Section 3 (Evaluation and Qualification Criteria) the Bidder shall provide the following information requested in the corresponding Information Sheets.





**Form ELI - 1: Bidder's Information Sheet**

<b>Bidder's Information</b>		
	<b>Information of the Bidder</b>	<b>If the Bidder is a subsidiary or branch, information of any parent company/companies</b>
<b>Names</b>	<b>Full legal name(s)</b>	
	<b>Full trading name(s) (if any)</b>	
<b>Addresses</b>	<b>Registered address(es)</b>	
	<b>Trading address(es)</b>	
	<b>Postal address(es) (if different from trading address)</b>	
<b>Type of organization</b>		
<b>Country of constitution/incorporation/registration</b>		
<b>Year of constitution/incorporation/registration</b>		
<b>Corporate or registration number</b>		
<b>In case of a Joint Venture, legal name of each partner</b>		
<b>Bidder's authorized representative</b> (name, address, telephone number(s), fax number(s), e-mail address)		
<p><b>Attached are copies of the following documents:</b></p> <ol style="list-style-type: none"> <li>1) In case of a single entity, articles of incorporation or constitution and company incorporation/registration of the legal entity named above, in accordance with ITB 4.1 and ITB 4.2.</li> <li>2) Authorization to represent the firm or Joint Venture named above, in accordance with ITB 20.2.</li> <li>3) In case of a Joint Venture, a letter of intent to form a Joint Venture or Joint Venture agreement, in accordance with ITB 4.1.</li> <li>4) In case of a government-owned enterprise, any additional documents not covered under 1 above required to comply with ITB 4.5.</li> </ol>		



**Form ELI - 2: Joint Venture Information Sheet**

Each partner of the Joint Venture and Specialist Subcontractor must fill out this form separately.

<b>Joint Venture / Specialist Subcontractor Information</b>		
<b>Bidder's legal name</b>		
		<b>Information of Joint Venture Partner or Specialist Subcontractor</b>
		<b>If any Joint Venture Partner or Specialist Subcontractor is a subsidiary or branch, information of any parent company/companies</b>
<b>Names</b>	<b>Full legal name(s)</b>	
	<b>Full trading name(s) (if any)</b>	
<b>Addresses</b>	<b>Registered address(es)</b>	
	<b>Trading address(es)</b>	
	<b>Postal address (es) (if different from trading address)</b>	
<b>Type of organization</b>		
<b>Country of constitution / incorporation/ registration</b>		
<b>Year of constitution / incorporation/ registration</b>		
<b>Corporate or registration number</b>		
<b>Joint Venture Partner's or Specialist Subcontractor's authorized representative information</b> (name, address, telephone number(s), fax number(s), e-mail address)		
<p><b>Attached are copies of the following documents.</b></p> <p><input type="checkbox"/> 1. Articles of incorporation or constitution of the legal entity named above, in accordance with ITB 4.1 and ITB 4.2.</p> <p><input type="checkbox"/> 2. Authorization to represent the firm named above, in accordance with ITB 20.2.</p> <p><input type="checkbox"/> 3. In the case of a government-owned enterprise, documents establishing legal and financial autonomy and compliance with commercial law, in accordance with ITB 4.5.</p> <p><input type="checkbox"/> 4. Registration with Pakistan Engineering Council (PEC), where required, in accordance with criterion 2.1.6 for eligibility under Section 3, Evaluation and Qualification Criteria.</p>		



**Form CON - 1: Historical Contract Nonperformance**

Each Bidder must fill out this form in accordance with Criteria 2.2.1 and 2.2.3 of Section 3 (Evaluation and Qualification Criteria) to describe any history of nonperforming contracts and pending litigation or arbitration formally commenced against it.

In case of a Joint Venture, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner's name:

Joint Venture Partner: \_\_\_\_\_

**Table 1: History of Nonperforming Contracts**

Choose one of the following:

No nonperforming contracts.

Below is a description of nonperforming contracts involving the Bidder (or each Joint Venture partner if Bidder is a Joint Venture).

Year	Description	Amount of Nonperformed Portion of Contract (\$ equivalent)	Total Contract Amount (\$ equivalent)
[insert year]	Contract Identification: [indicate complete contract name/ number, and any other identification] Name of Employer: [insert full name] Address of Employer: [insert street/city/country] Reason(s) for nonperformance: [indicate main reason(s)]	[insert amount]	[insert amount]

**Table 2: Pending Litigation and Arbitration**

Choose one of the following:

No pending litigation, arbitration or any other material events impacting the net worth and/or liquidity of the bidder.

Below is a description of all pending litigation, arbitration involving the Bidder or any other material events impacting the net worth and/or liquidity of the bidder (or each Joint Venture partner if Bidder is a Joint Venture).

Year	Matter in Dispute	Value of Pending Claim in \$ Equivalent	Value of Pending Claim as a Percentage of Net Worth
[insert year]	Contract Identification, as applicable: [indicate complete contract name/ number, and any other identification] Name of Employer, parties involved in the material events impacting the net worth and/or liquidity of the bidder: [insert full name] Address of Employer, parties involved in the material events impacting the net worth and/or liquidity of the bidder: [insert street/city/country] Matter of Dispute: [indicate full description of dispute] Party who initiated the dispute: [indicate "Employer" or "Contractor"] Status: [indicate status of dispute]	[insert amount]	[insert amount]

**NOTE**

Table 2 of this form shall only be included if Criterion 2.2.3 of Section 3 (Evaluation and Qualification Criteria) is applicable.



**Form CON – 2: EHS Performance Declaration**

Each Bidder must fill out this form in accordance with Criterion 2.2.4 of Section 3 (Evaluation and Qualification Criteria).

In case of a Joint Venture, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner's name:

Joint Venture Partner: \_\_\_\_\_

In case of a Specialist Subcontractors, each Specialist Subcontractor must fill out this form and provide the Specialist Subcontractor's name:

Specialist Subcontractor: \_\_\_\_\_

Environmental and Health and Safety Performance Declaration in accordance with Section 3 (Evaluation and Qualification Criteria)			
<input type="checkbox"/> <b>No suspension or termination of contract:</b> An employer has not suspended or terminated a contract and/or called the performance security for a contract for reasons related to Environmental or Health and Safety performance since the date specified in Section 3 (Evaluation and Qualification Criteria), Criterion 2.5.			
<input type="checkbox"/> <b>Declaration of suspension or termination of contract:</b> The following contract(s) has/have been suspended or terminated and/or Performance Security called by an employer(s) for reasons related to Environmental or Health and Safety performance since the date specified in Section 3 (Evaluation and Qualification Criteria), Criterion 2.5. Details are described below:			
<input type="checkbox"/> <b>Declaration of request for replacement of Key Environment, Health and Safety Personnel:</b> The following contract(s) has/have experienced a request by the Employer to replace Environmental, Health and Safety Personnel for reasons related to Environmental or Health and Safety performance since the date specified in Section 3 (Evaluation and Qualification Criteria), Criterion 2.5. Details are described below:			
<input type="checkbox"/> <b>Declaration of past fatality resulted from EHS issues on site:</b> The following contract(s) has/have experienced a fatality resulted from EHS issues on site since the date specified in Section 3 (Evaluation and Qualification Criteria), Criterion 2.5. Details are described below:			
Year	Suspended or terminated portion of contract	Contract Identification	Total Contract Amount (current value, currency, exchange rate and US\$ equivalent)
[insert year]	[insert amount and percentage]	Contract Identification: [indicate complete contract name/ number, and any other identification] Name of Employer: [insert full name] Address of Employer: [insert street/city/country] Reason(s) for suspension or termination: [indicate main reason(s) e.g. discharge over environmental limit, workers did not have required health and safety permits to undertake high risk work, work carried out was not adhered to approved construction methodology and quality control plan]	[insert amount]
[insert year]	[insert amount and percentage]	Contract Identification: [indicate complete contract name/ number, and any other identification] Name of Employer: [insert full name] Address of Employer: [insert street/city/country] Reason(s) for suspension or termination: [indicate main reason(s)]	[insert amount]
...	...	[list all applicable contracts]	...
Performance Security called by an employer(s) for reasons related to EHS performance			
Year	Contract Identification		Total Contract Amount (current value, currency, exchange rate and US\$ equivalent)
[insert year]	Contract Identification: [indicate complete contract name/ number, and any other identification] Name of Employer: [insert full name] Address of Employer: [insert street/city/country]		[insert amount]



	Reason(s) for suspension or termination: [indicate main reason(s) e.g. discharge over environmental limit, workers did not have required health and safety permits to undertake high risk work, work carried out was not adhered to approved construction methodology and quality control plan]	
<b>Key EHS personnel replacement requested by the Employer for reasons related to EHS performance</b>		
<b>Year</b>	<b>Contract Identification and Reasons</b>	<b>Personnel replacement action and results</b>
[insert year]	Contract Identification: [indicate complete contract name/ number, and any other identification] Name of Employer: [insert full name] Address of Employer: [insert street/city/country] Reason(s) for requesting for replacement: [indicate main reason(s)]	[insert description]
<b>Fatality due to EHS issues on Site</b>		
<b>Year</b>	<b>Contract Identification</b>	<b>Follow-on actions taken by the contractor</b>
[insert year]	Contract Identification: [indicate complete contract name/ number, and any other identification] Name of Employer: [insert full name] Address of Employer: [insert street/city/country] Description of fatality event: Causation:	[insert description]



**Form FIN - 1: Historical Financial Performance**

Each Bidder must fill out this form.

In case of a Joint Venture, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner's name:

Joint Venture Partner: \_\_\_\_\_

Financial Data for Previous three (03) Years [PKR or US\$ Equivalent]		
Year 1:	Year 2:	Year 3:

**Information from Balance Sheet**

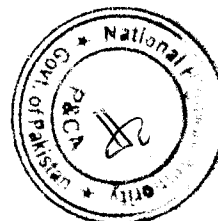
Total Assets (TA)			
Total Liabilities (TL)			
Net Worth = TA - TL			
Current Assets (CA)			
Current Liabilities (CL)			

Most Recent Working Capital		To be obtained for most recent year and carried forward to FIN-3 Line 1; in case of Joint Ventures, to the corresponding Joint Venture Partner's FIN-3.
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**Information from Income Statement**

Total Revenues			
Profits Before Taxes			
Profits After Taxes			

- Attached are copies of financial statements (balance sheets including all related notes and income statements) for the last three (03) years, as indicated above, complying with the following conditions:
- 1) Unless otherwise required by Section 3 of the Bidding Document, all such documents reflect the standalone financial situation of the legal entity or entities comprising the Bidder and not the Bidder's parent companies, subsidiaries, or affiliates.
  - 2) Historical financial statements must be audited by a certified accountant.
  - 3) Historical financial statements must be complete, including all notes to the financial statements.
  - 4) Historical financial statements must correspond to accounting periods already completed and audited (no statements for partial periods shall be requested or accepted).



**Form FIN - 2: Average Annual Construction Turnover**

Each Bidder must fill out this form.

The information supplied should be the Annual Turnover of the Bidder or each partner of a Joint Venture for the total certified payments received from the clients for contracts in progress or completed, converted to US dollars at the rate of exchange at the end of the period reported.

In case of a Joint Venture, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner's name:

Joint Venture Partner: \_\_\_\_\_

Annual Turnover Data for the Last three (03) Years (Construction only)			
Year	Amount Currency	Exchange Rate	US\$ Equivalent
Average Annual Construction Turnover			



**Form FIN – 3: Availability of Financial Resources**

Bidders must demonstrate sufficient financial resources, usually comprising of Working Capital supplemented by credit line statements or overdraft facilities and others to meet the Bidder's financial requirements for its current contract commitments, and the subject contract.

In case of a Joint Venture, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner's name:

Joint Venture Partner: \_\_\_\_\_

Financial Resources		
No.	Source of financing	Amount (\$ equivalent)
1	Working Capital (to be taken from FIN - 1)	
2	Credit Line <sup>a</sup>	
3	Other Financial Resources	
Total Available Financial Resources		

<sup>a</sup> To be substantiated by a letter from the bank issuing the line of credit. (i) address to the Client; (ii) shall be issued within last 02 month; (iv) it should be unconditional; and (v) credit line must be valid and available (specifying the remaining balance of the credit) to the bidder for the complete Time for Completion of the Project).





**Form FIN- 4: Financial Requirements for Current Contract Commitments**

Bidders (or each Joint Venture partner) 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.

In case of a Joint Venture, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner's name:

Joint Venture Partner: \_\_\_\_\_

Current Contract Commitments						
No.	Name of Contract	Employer's Contact (Address, Tel, Fax)	Contract Completion Date	Outstanding Contract Value (X) <sup>a</sup>	Remaining Contract Period in months (Y) <sup>b</sup>	Monthly Financial Resources Requirement (X / Y)
1						
2						
3						
4						
<b>Total Monthly Financial Requirement for Current Contract Commitments</b>						<b>PKR or US\$ Equivalent . . . . .</b>

<sup>a</sup> Remaining outstanding contract values to be calculated from 28 days prior to the bid submission deadline (\$ equivalent based on the foreign exchange rate as of the same date).  
<sup>b</sup> Remaining contract period to be calculated from 28 days prior to bid submission deadline.



**Form FIN - 5: Self-Assessment Tool for Bidder's Compliance to Financial Resources (Criterion 2.3.3 of Section 3)**

This form requires the same information submitted in Forms FIN - 3 and FIN - 4. All conditions of "Available Financial Resources Net of CCC  $\geq$  Requirement for the Subject Contract" must be satisfied to qualify.

**Form FIN - 5A: For Single Entities**

For Single Entities: (A)	Total Available Financial Resources from FIN - 3 (B)	Total Monthly Financial Requirement for Current Contract Commitments (CCC) from FIN - 4 (C)	Available Financial Resources Net of CCC $D = (B - C)$	Requirement for the Subject Contract (E)	Results: Yes or No [D must be greater than or equal to E] (F)
_____ (Name of Bidder)				.....	

**Form FIN - 5B: For Joint Ventures**

For Joint Ventures: (A)	Total Available Financial Resources from FIN - 3 (B)	Total Monthly Financial Requirement for Current Contract Commitments (CCC) from FIN - 4 (C)	Available Financial Resources Net of CCC $D = (B - C)$	Requirement for the Subject Contract (E)	Results: Yes or No [D must be greater than or equal to E] (F)
One Partner:					
_____ (Name of Partner)				.....	
Each Partner:					
_____ (Name of Partner 1)				.....	
_____ (Name of Partner 2)				.....	
_____ (Name of Partner 3)				.....	
All partners combined	$\Sigma D =$ Sum of available financial resources net of current contract commitments for all partners		$\Sigma D =$ _____	.....	

**NOTE**

Form FIN - 5 is made available for use by the bidder as a self-assessment tool, and by the Employer as an evaluation work sheet, to determine compliance with the financial resources requirement as stated in 2.3.3. Failure to submit Form FIN - 5 by the Bidder shall not lead to bid rejection.

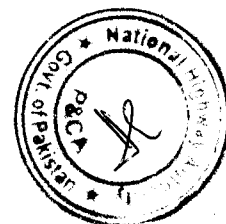


**Form EXP – 1: Contracts of Similar Size and Nature**

Fill out one (1) form per contract. Each contract shall be supported by documents such as Signed Contract Agreement, Taking-Over Certificate, Contract Completion Certificate or Performance Certificate.

The exchange rate to be used to calculate the value of the contract for conversion to a specific currency shall be the selling rate of the Borrower's Central bank on the date of the contract.

<b>Contract of Similar Size and Nature</b>			
<b>Contract No . . . . . of</b> .....	<b>Contract Identification</b>		
<b>Award Date</b>		<b>Completion Date</b>	
<b>Total Contract Amount</b>	<b>PKR or US\$ Equivalent</b>		
<b>If partner in a Joint Venture or Subcontractor, specify participation of total contract amount</b>	<b>Percent of Total</b>	<b>Amount</b>	
<b>Employer's name</b> <b>Address</b> <b>Telephone number</b> <b>Fax number</b> <b>E-mail</b>	<p>Signed Contract Agreement, and Taking-Over Certificate, Contract Completion Certificate or Performance Certificate, Accurate Contact Details of the relevant officer for verification of the provided documentation (if required), in sufficient detail to verify the contract name, value, completion time (or substantial completion), and all requirements for similarity.</p> <p>If the documents are other than in English, an accurate certified translation of these documents in English shall be provided. The Employer may also require the Bidder to provide additional documentation if deemed necessary.</p> <p>For contracts under which the Bidder participated as a Joint Venture partner or Subcontractor, only the Bidder's respective share, by value, shall be considered to meet this requirement. The Bidders are required to complete Form EXP-1, indicating both the percentage and amount of their participation in the total contract amount. Additionally, they may be required to provide relevant details, such as joint venture (JV) or subcontract agreements, payment receipts etc.</p> <p>For contracts implemented by a Joint Venture contractor, if the Bidder comprises the same Joint Venture with same share of the partners, the 'Single Entity' requirements will apply.</p>		
<b>Description of the Similarity in Accordance with Criterion 2.4.1 of Section 3 (Evaluation and Qualification Criteria)</b>			



The similarity of the Bidder's participation shall be based on:

1. the physical size
2. nature of works
3. complexity, methods
4. technology or
5. other characteristics



**Form EXP – 2: Construction Experience in Key Activities**

Fill out one (1) form per contract. Each contract shall be supported by documents such as Signed Contract Agreement, Taking-Over Certificate or Contract Completion Certificate.

Each Bidder must fill out this form.

If complied by Specialist Subcontractor, each Specialist Subcontractor must fill out this form and provide the Specialist Subcontractor's name:

Specialist Subcontractor: \_\_\_\_\_

Contract with Similar Key Activities			
Contract No . . . . . of . . . . .	Contract Identification		
Award Date		Completion Date	
Total Contract Amount	PKR or US\$ Equivalent _____		
If partner in a Joint Venture or Subcontractor, specify participation of total contract amount	Percent of Total	Amount	
Employer's name Address Telephone number Fax number E-mail	Form EXP – 2 shall be supported by documents such as Signed Contract Agreement, Taking-Over Certificate or Contract Completion Certificate indicating the contract name, value, completion date (or percentage of substantial completion), activities performed by Joint Venture partners, and other relevant details sufficient to demonstrate experience in Key Activities.		
Description of the Key Activities in Accordance with Criterion 2.4.2 of Section 3 (Evaluation and Qualification Criteria)			
Construction experience is required in the following key activities:	_____		



**Form EXP – 3: Specific Experience in Managing Environmental, Health and Safety Aspects**

Fill out one (1) form per contract.

Each Bidder must fill out this form.

In case of a Joint Venture, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner's name:

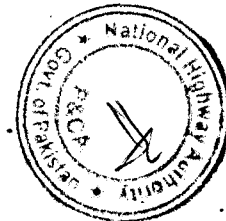
Joint Venture Partner: \_\_\_\_\_

1. Key Requirement no 1 in accordance with Criterion 2.4.3 of Section 3: \_\_\_\_\_

<b>Contract Identification</b>				
<b>Award date</b>				
<b>Completion date</b>				
<b>Role in Contract</b>	<b>Prime Contractor</b> <input type="checkbox"/>	<b>Member in Joint Venture</b> <input type="checkbox"/>	<b>Management Contractor</b> <input type="checkbox"/>	<b>Subcontractor</b> <input type="checkbox"/>
<b>Total Contract Amount</b>			<b>PKR or US\$ Equivalent...</b>	
<b>Details of relevant experience</b>				

2. Key Requirement no 2 in accordance with Criterion 2.4.3 of Section 3: \_\_\_\_\_

3. Key Requirement no 3 in accordance with Criterion 2.4.3 of Section 3: \_\_\_\_\_



## Form EXP – 4: Environmental, Health and Safety Certification

Please provide the following information:

Availability of the following valid ISO certification or internationally recognized equivalent (equivalency to be demonstrated by the Bidder), and applicable to the worksite:

- ☐ Quality management certificate ISO 9001
- ☐ Environmental management certificate ISO 14001
- ☐ Health and Safety management certificate ISO 45001

<sup>a</sup> Depending on the environmental, health and safety issues of the worksite and the type of competition planned (national or international), the list of required certifications may be restricted to those corresponding to the main issue of the worksite management or removed altogether.

## Form EXP – 5: Environmental, Health and Safety Documentation

Please provide the following information:

Availability of in-house policies and procedures acceptable to the Employer for EHS management:

1. Existence of an Ethics Charter.
2. Existence of a system for monitoring compliance with EHS commitments for the Bidder's Subcontractors and all its partners.
3. Existence of official company procedures for the management of the following relevant points.

[Select 3-5 that apply for the worksite from below options- as per Section 2]

- ☐ EHS resources and facilities and EHS monitoring system.
- ☐ Project Areas management information (base camps, quarries, burrow pits, storage areas).
- ☐ Health and Safety on worksites policy and related guidance.
- ☐ Local recruitment and EHS trainings of local staff/subcontractors/local partners.
- ☐ Community stakeholder engagement practice.
- ☐ Traffic management practice.
- ☐ Hazardous products management practice.
- ☐ Waste management practice.
- ☐ Protection of water resources.
- ☐ Biodiversity protection practices.
- ☐ Site rehabilitation and revegetation practice.
- ☐ Local cultural heritage protection practice.
- ☐ Erosion and sedimentation practices; and
- ☐ Control of infectious and communicable diseases (HIV/AIDS, malaria, COVID-19, etc.)

## Form EXP – 6: Environmental, Health and Safety Dedicated Personnel

Please provide CV [Form PER-2] of the in-house personnel of the main contractor/Joint Venture partners for the EHS positions specified in Section 6 (Works' Requirements):

- ☐ Environmental Specialist
- ☐ Health and Safety Specialist



# Schedules

## Schedule of Payment Currencies

For Construction of Additional Carriageway from Rajanpur – DG Khan N55 Highway Section (121.5 Km) and DG Khan – DG Khan N55 Highway Section (208.0 Km) from Two-Lane to Four-Lane.

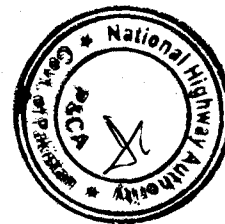
Lot-1: Rajanpur – Jampur Section (57.50 Km)

Separate tables may be required if the various sections of the Works (or of the Bill of Quantities) will have substantially different foreign and local currency requirements. In such a case, the Employer should prepare separate tables for each Section of the Works.

	A	B	C	D
Name of Payment Currency	Amount of Currency	Rate of Exchange to Local Currency	Local Currency Equivalent $C = A \times B$	Percentage of Net Bid Price (NBP) $\frac{100 \times C}{NBP}$
Local Currency		1.00		
Foreign Currency #1				
Foreign Currency #2				
Foreign Currency #3				
Net Bid Price				100.00
Provisional Sums Expressed in Local Currency	To be entered by the Employer	1.00	To be entered by the Employer	
BID PRICE				

**Note**

The rates of exchange shall be the selling rates 28 days prior to the deadline for submission of bids published by the source specified in BDS 15.





# Schedules

## Schedule of Payment Currencies

For Construction of Additional Carriageway from Rajanpur – DG Khan N55 Highway Section (121.5 Km) and DG Khan – DG Khan N55 Highway Section (208.0 Km) from Two-Lane to Four-Lane.

Lot-2: Jampur – DG Khan Section (64.0 Km)

Separate tables may be required if the various sections of the Works (or of the Bill of Quantities) will have substantially different foreign and local currency requirements. In such a case, the Employer should prepare separate tables for each Section of the Works.

	A	B	C	D
Name of Payment Currency	Amount of Currency	Rate of Exchange to Local Currency	Local Currency Equivalent $C = A \times B$	Percentage of Net Bid Price (NBP) $\frac{100 \times C}{NBP}$
Local Currency		1.00		
Foreign Currency #1				
Foreign Currency #2				
Foreign Currency #3				
Net Bid Price				100.00
Provisional Sums Expressed in Local Currency	To be entered by the Employer	1.00	To be entered by the Employer	
BID PRICE				

**- Note -**

- The rates of exchange shall be the selling rates 28 days prior to the deadline for submission of bids published by the source specified in BDS 15.



# Schedules

## Schedule of Payment Currencies

For Construction of Additional Carriageway from Rajanpur – DG Khan N55 Highway Section (121.5 Km) and DG Khan – DG Khan N55 Highway Section (208.0 Km) from Two-Lane to Four-Lane.

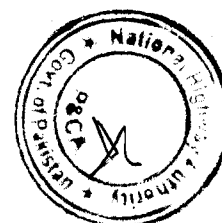
Lot-3: DG Khan to Tibi Qaisrani via Shahdan Lund Section (111.70 Km)

Separate tables may be required if the various sections of the Works (or of the Bill of Quantities) will have substantially different foreign and local currency requirements. In such a case, the Employer should prepare separate tables for each Section of the Works.

	A	B	C	D
Name of Payment Currency	Amount of Currency	Rate of Exchange to Local Currency	Local Currency Equivalent $C = A \times B$	Percentage of Net Bid Price (NBP) $\frac{100 \times C}{NBP}$
Local Currency		1.00		
Foreign Currency #1				
Foreign Currency #2				
Foreign Currency #3				
Net Bid Price				100.00
Provisional Sums Expressed in Local Currency	To be entered by the Employer	1.00	To be entered by the Employer	
BID PRICE				

**- Note -**

- The rates of exchange shall be the selling rates 28 days prior to the deadline for submission of bids published by the source specified in BDS 15.



# Schedules

## Schedule of Payment Currencies

For Construction of Additional Carriageway from Rajanpur – DG Khan N55 Highway Section (121.5 Km) and DG Khan – DG Khan N55 Highway Section (208.0 Km) from Two-Lane to Four-Lane.

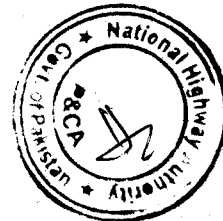
Lot-4: Tibi Qaisrani to DI Khan via Ramak Section (96.245 Km)

Separate tables may be required if the various sections of the Works (or of the Bill of Quantities) will have substantially different foreign and local currency requirements. In such a case, the Employer should prepare separate tables for each Section of the Works.

	A	B	C	D
Name of Payment Currency	Amount of Currency	Rate of Exchange to Local Currency	Local Currency Equivalent $C = A \times B$	Percentage of Net Bid Price (NBP) $\frac{100 \times C}{NBP}$
Local Currency		1.00		
Foreign Currency #1				
Foreign Currency #2				
Foreign Currency #3				
Net Bid Price				100.00
Provisional Sums Expressed in Local Currency	To be entered by the Employer	1.00	To be entered by the Employer	
<b>BID PRICE</b>				

**Note**

- The rates of exchange shall be the selling rates 28 days prior to the deadline for submission of bids published by the source specified in BDS 15.



## Schedule of Cost Indexation

[The formulae for price adjustment shall be of the following general type:]

$$P_n = a + b L_n / L_o + c E_n / E_o + d M_n / M_o + \dots$$

where:

"P<sub>n</sub>" is the adjustment multiplier to be applied to the estimated contract value in the relevant currency of the work carried out in period "n", this period being a month unless otherwise stated in the Contract Data;

"a" is a fixed coefficient, stated in the relevant table of adjustment data, representing the non-adjustable portion in contractual payments.

"b", "c", "d", ... are coefficients representing the estimated proportion of each cost element related to the execution of the Works as stated in the relevant table of adjustment data; such tabulated cost elements may be indicative of resources such as labor, equipment and materials.

"L<sub>n</sub>", "E<sub>n</sub>", "M<sub>n</sub>", ... are the current cost indices or reference prices for period "n", expressed in the relevant currency of payment, each of which is applicable to the relevant tabulated cost element on the date 49 days prior to the last day of the period (to which the particular Payment Certificate relates); and

"L<sub>o</sub>", "E<sub>o</sub>", "M<sub>o</sub>", ... are the base cost indices or reference prices, expressed in the relevant currency of payment, each of which is applicable to the relevant tabulated cost element on the Base Date.

The weightings (coefficients) for each of the factors of cost stated in the table(s) of adjustment data shall only be adjusted if they have been rendered unreasonable, unbalanced or inapplicable, as a result of Variations.

The cost indices stated in the Table of Adjustment Data shall be used. If their source is in doubt, it shall be determined by the Engineer. For this purpose, reference shall be made to the values of the indices at stated dates.

If the currency in which the Contract price is expressed is different from the currency of the country of origin of the indices, a correction factor will be applied to avoid incorrect adjustments of the Contract Price. The correction factor shall be:  $Z_0 / Z_1$ , where,

Z<sub>0</sub> = the number of units of currency of the origin of the indices which equal to one unit of the currency of the Contract Price at the Base Date, and

Z<sub>1</sub> = the number of units of currency of the origin of the indices which equal to one unit of the currency of the Contract Price at the Date of Adjustment.



## Tables of Adjustment Data

Table A - Local Currency

**For Construction of Additional Carriageway from Rajanpur – DG Khan N55 Highway Section (121.5 Km) and DG Khan – DG Khan N55 Highway Section (208.0 Km) from Two-Lane to Four-Lane.**

**Lot-1: Rajanpur – Jampur Section (57.50.0 Km)**

S/No	Description	Unit	Weightages	Applicable Index
1	2	3	4	5
(i)	Fixed Portion	-	0.58	-
(ii)	Fuel [High Speed Diesel]	Liter	0.13	Monthly Statistical Bulletin, Pakistan Bureau of Statistics / Pakistan State Oil (District: DG Khan)
(iii)	Labour [Unskilled]	Day (Per Day)	0.03	Monthly Statistical Bulletin, Pakistan Bureau of Statistics GOP (District: DG Khan)
(iv)	Cement [Ordinary Portland Cement]	Per Bag	0.03	Monthly Statistical Bulletin, Pakistan Bureau of Statistics GOP (District: DG Khan)
(v)	Steel [Iron Bar (M.S. Bar 1/2" ]	Metric Ton	0.07	Monthly Statistical Bulletin, Pakistan Bureau of Statistics GOP (District: DG Khan)
(vi)	Bitumen [Grade 60/70 (in bulk)]	Metric Ton	0.16	Attock Petroleum Limited, Rawalpindi
	<b>Total</b>		<b>1.000</b>	

Note:

1. The Base prices of Specified Materials shall be as of actual prevailing on the date falling on 28 days prior to date of submission of Bids (inclusive all kinds of taxes and duties that can be levied at the source) and shall be obtained from the respective sources, and to be verified and notified by the Engineer after the consent of the Employer.
2. The current price are meant to be ex-factory prices (inclusive all kinds of taxes and duties that can be levied at the source) 28 days prior to submitted date of IPC. (Price adjustment shall be processed month wise).
3. Adjustment of increase / decrease shall only be admissible for the materials listed above.
4. Value of work done for price adjustment shall be value of permanent works (Excluding Provisional Sums and Bill no 07; General Items) -
5. All amounts in Pak Rupees only



## Tables of Adjustment Data

Table A - Local Currency

**For Construction of Additional Carriageway from Rajanpur – DG Khan N55 Highway Section (121.5 Km) and DG Khan – DG Khan N55 Highway Section (208.0 Km) from Two-Lane to Four-Lane.**

**Lot-2: Jampur – DG Khan Section (64.0 Km)**

S/No	Description	Unit	Weightages	Applicable Index
1	2	3	4	5
(i)	Fixed Portion	-	0.57	-
(ii)	Fuel [High Speed Diesel]	Liter	0.13	Monthly Statistical Bulletin, Pakistan Bureau of Statistics / Pakistan State Oil
(iii)	Labour [Unskilled]	Day (Per Day)	0.03	Monthly Statistical Bulletin, Pakistan Bureau of Statistics GOP (District: DG Khan)
(iv)	Cement [Ordinary Portland Cement]	Metric Ton	0.04	Monthly Statistical Bulletin, Pakistan Bureau of Statistics GOP (District: DG Khan)
(v)	Steel [Iron Bar (M.S. Bar 1/2" ]	Metric Ton	0.09	Monthly Statistical Bulletin, Pakistan Bureau of Statistics GOP (District: DG Khan)
(vi)	Bitumen [Grade 60/70 (in bulk)]	Metric Ton	0.14	Attock Petroleum Limited, Rawalpindi
	<b>Total</b>		<b>1.000</b>	

**Note:**

1. The Base prices of Specified Materials shall be as of actual prevailing on the date falling on 28 days prior to date of submission of Bids (inclusive all kinds of taxes and duties that can be levied at the source) and shall be obtained from the respective sources, and to be verified and notified by the Engineer after the consent of the Employer.
2. The current price are meant to be ex-factory prices (inclusive all kinds of taxes and duties that can be levied at the source) 28 days prior to submitted date of IPC. (Price adjustment shall be processed month wise).
3. Adjustment of increase / decrease shall only be admissible for the materials listed above.
4. Value of work done for price adjustment shall be value of permanent works (Excluding Provisional Sums and Bill no 07; General Items)
5. All amounts in Pak Rupees only



## Tables of Adjustment Data

Table A - Local Currency

**For Construction of Additional Carriageway from Rajanpur – DG Khan N55 Highway Section (121.5 Km) and DG Khan – DG Khan N55 Highway Section (208.0 Km) from Two-Lane to Four-Lane.**

**Lot-3: DG Khan to Tibi Qaisrani via Shahdan Lund Section (111.70 Km)**

S/No	Description	Unit	Weightages	Applicable Index
1	2	3	4	5
(i)	Fixed Portion	-	0.57	-
(ii)	Fuel [High Speed Diesel]	Liter	0.12	Monthly Statistical Bulletin, Pakistan Bureau of Statistics / Pakistan State Oil
(iii)	Labour [Unskilled]	Day (Per Day)	0.03	Monthly Statistical Bulletin, Pakistan Bureau of Statistics GOP (District: DG Khan)
(iv)	Cement [Ordinary Portland Cement]	Metric Ton	0.04	Monthly Statistical Bulletin, Pakistan Bureau of Statistics GOP (District: DG Khan)
(v)	Steel [Iron Bar (M.S. Bar 1/2" ]	Metric Ton	0.10	Monthly Statistical Bulletin, Pakistan Bureau of Statistics GOP (District: DG Khan)
(vi)	Bitumen [Grade 60/70 (in bulk)]	Metric Ton	0.14	Attock Petroleum Limited, Rawalpindi
	<b>Total</b>		<b>1.000</b>	

Note:

1. The Base prices of Specified Materials shall be as of actual prevailing on the date falling on 28 days prior to date of submission of Bids (inclusive all kinds of taxes and duties that can be levied at the source) and shall be obtained from the respective sources, and to be verified and notified by the Engineer after the consent of the Employer.
2. The current price are meant to be ex-factory prices (inclusive all kinds of taxes and duties that can be levied at the source) 28 days prior to submitted date of IPC. (Price adjustment shall be processed month wise).
3. Adjustment of increase /-decrease shall only be admissible for the materials listed above.
4. Value of work done for price adjustment shall be value of permanent works (Excluding Provisional Sums and Bill no 07; General Items)
5. All amounts in Pak Rupees only



## Tables of Adjustment Data

Table A - Local Currency

**For Construction of Additional Carriageway from Rajanpur – DG Khan N55 Highway Section (121.5 Km) and DG Khan – DG Khan N55 Highway Section (208.0 Km) from Two-Lane to Four-Lane.**

**Lot-4: Tibi Qaisrani to DI Khan via Ramak Section (96.245 Km)**

S/No	Description	Unit	Weightages	Applicable Index
1	2	3	4	5
(i)	Fixed Portion	-	0.55	-
(ii)	Fuel [High Speed Diesel]	Liter	0.12	Monthly Statistical Bulletin, Pakistan Bureau of Statistics / Pakistan State Oil
(iii)	Labour [Unskilled]	Day (Per Day)	0.03	Monthly Statistical Bulletin, Pakistan Bureau of Statistics GOP (District: DG Khan)
(iv)	Cement [Ordinary Portland Cement]	Metric Ton	0.04	Monthly Statistical Bulletin, Pakistan Bureau of Statistics GOP (District: DG Khan)
(v)	Steel [Iron Bar (M.S. Bar) 1/2" ]	Metric Ton	0.11	Monthly Statistical Bulletin, Pakistan Bureau of Statistics GOP (District: DG Khan)
(vi)	Bitumen [Grade 60/70 (in bulk)]	Metric Ton	0.15	Attock Petroleum Limited, Rawalpindi
	<b>Total</b>		<b>1.000</b>	

Note:

1. The Base prices of Specified Materials shall be as of actual prevailing on the date falling on 28 days prior to date of submission of Bids (inclusive all kinds of taxes and duties that can be levied at the source) and shall be obtained from the respective sources, and to be verified and notified by the Engineer after the consent of the Employer.
2. The current price are meant to be ex-factory prices (inclusive all kinds of taxes and duties that can be levied at the source) 28 days prior to submitted date of IPC. (Price adjustment shall be processed month wise).
3. Adjustment of increase / decrease shall only be admissible for the materials listed above.
4. Value of work done for price adjustment shall be value of permanent works (Excluding Provisional Sums and Bill no 07; General Items)
5. All amounts in Pak Rupees only





**Table B - Foreign Currency Payment**

Name of Currency: [Insert name of currency. If the bidder wishes to quote in more than one foreign currency, this table should be repeated for each foreign currency such as #1, #2 and #3]

To be entered by the Bidder				
Index Code	Index Description	Source of Index	Base Value and Date	Bidder's Proposed Weighting
L: Labor	Nonadjustable	—	—	a: 0.15
E: Equipment				b: _____
M1: Material 1				c: _____
M2: Material 2				d: _____
...etc...				e: _____
Total				1.00

To be entered by the Bidder.

**NOTES**

As per GCC 1.1.4, "Base Date" means the date 28 days prior to the latest date for submission of the bid.

For a given currency, the "Source of Index" should be issued or published within the country to which the currency relates.

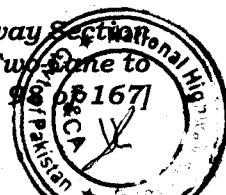
Tables of Adjustment Data shall only be included if prices are to be quoted as adjustable prices in accordance with ITB 14.5.



# Bill of Quantities

## A. Preamble

1. The Bill of Quantities shall be read in conjunction with the Instructions to Bidders, General and Particular 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 Engineer 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 Engineer may fix within the terms of the Contract.
3. The rates and prices bid in the priced Bill of Quantities shall, except as otherwise provided under the Contract include all construction equipment, labour, supervision, materials, erection, maintenance, insurance, profit, taxes and duties; together with all general risks, liabilities and obligations set out or implied in the Contract. Furthermore, all duties, taxes and other levies payable by the Contractor under the Contract, or for any other cause, as on the date 28 days prior to deadline for submission of Bids, shall be included in the rates and prices and the total Bid Price submitted by the Bidder.
4. 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 covered by other rates and prices entered in the Bill of Quantities. The units and rates in figures entered into the Bill of Quantities should be typewritten; and written by hand, must be in print form. A Bill of Quantities not presented accordingly may be considered nonresponsive.
5. 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 the Work.
6. General directions and descriptions of works and materials are not necessarily repeated or 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
7. Provisional Sums if included and so designated in the Bill of Quantities shall be expended in whole or in part at the direction and discretion of the Engineer in accordance with the Conditions of Contract.
8. The "Ref Specs" mentioned in the Bill of Quantities indicates the Technical Specifications section number(s) which are to be followed during execution of item of work in accordance with the applicable drawings.
9. Unless otherwise stated in the text of the priced Bill of Quantities, the quantities have to be measured and paid in accordance with the Measurement and Payment Clauses given in the relevant Technical Specifications or in accordance with implied meaning of the specifications. Any special method of measurement stated in the text of priced Bill of Quantities is limited to the concerned items only.
10. All rates and amounts are in Pakistani Rupees. For the purpose of clarity, it is elaborated regarding serial no. 03 of Preamble to this Bill of Quantities, the Contractor is expected to consider all applicable, provincial and federal, direct and indirect taxes,



in accordance with the relevant laws of Pakistan, in their rates against each item of the Bill of Quantities for example: Provincial Sales Tax, General Sales Tax (GST), Duties, Levies etc.

- 11 Note: The bid price is inclusive of all Environmental, Health and Safety management and compliance cost.
- 12 Arithmetic errors will be corrected by the Employer as follows:
- 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.
  - 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.
  - 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 Bid, the bid price in the Summary of Bill of Quantities will prevail and the bid amount in item (c) of the Letter of Bid will be corrected.
  - 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.
- 13 Rock is defined as all materials that, in the opinion of the Engineer, require blasting, or the use of metal wedges and sledgehammers, or the use of compressed air drilling for their removal, and that cannot be extracted by ripping with a tractor of at least 150 brake horsepower with a single, rear-mounted, heavy-duty ripper.
- 14 A specific Provisional Sum for the work of the DAAB shall be used to cover the Employer's share (50%) of the DAAB members' fees and expenses, in accordance with Clause 21 [Dispute and Arbitration]. Notwithstanding the foregoing, no prior instruction of the Engineer shall be required for use of this specific Provisional Sum. The Contractor shall submit the DAAB members' invoices and satisfactory evidence of having paid 100% of such invoices as part of supporting documents of those Statements submitted under Sub-Clause 14.3 [Application for Interim Payment]. No overhead and profit shall be paid to the Contractor in respect of this Provisional Sum. Alternately, the Employer may decide to include the DAAB member's fees and expenses under Provisional Sums for contingency.

## **B. Work Items**

1. Bill of Quantities (BOQs) are attached.
2. Bidders shall Price the Bill of Quantities in Pakistani Rupees Only.



**ISLAMIC REPUBLIC OF PAKISTAN  
NATIONAL HIGHWAY AUTHORITY**



**OCB/CAREC/T-III:**

**Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 KM) from Two-Lane to Four-Lane Under one Package Comprising of Four Lots**

➤ *Lot-1: Rajanpur – Jampur Section (57.50 Km)*

**BILL OF QUANTITIES**



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**  
**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

**BILL OF QUNATITIES**

**SUMMARY**

S/NO	DESCRIPTION	TOTAL AMOUNT IN FIGURES (PKR)
1	EARTHWORK AND ALLIED ACTIVITIES	
2	SUB BASE & BASE	
3	SURFACE COURSES AND PAVEMENT	
4.1	STRUCTURES (BRIDGES)	
4.2	STRUCTURES (BOX CULVERTS)	
4.3	STRUCTURES (CATTLE CREEP)	
4.4	STRUCTURES (SUBWAYS)	
4.5	STRUCTURES (PIPE CULVERTS)	
4.6	STRUCTURES (SOIL INVESTIGATION FOR BRIDGES)	
5	DRAINAGE & EROSION WORKS	
6	ANCILLARY WORKS	
7	GENERAL ITEMS	
8	ELECTRICAL ITEMS	
	<b>TOTAL CONSTRUCTION COSTS</b>	

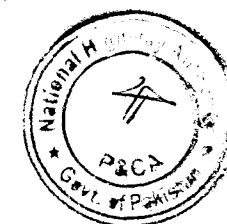


**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and  
DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four  
Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

**BILL NO. 1 : EARTH WORK**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
101	Clearing and Grubbing	S.M	1,471,690.00			-
102a	Removal of Trees 150-300 mm Girth	Each	25.00			-
102b	Removal of Trees 301-600 mm Girth	Each	25.00			-
102c	Removal of Trees 601mm or over Girth	Each	10.00			-
104	Compaction of Natural Ground	S.M	1,471,690.00			-
106a	Excavate Unsuitable Common Material	C.M	15,230.00			-
108a	Formation of Embankment from Roadway Excavation in Common Material	C.M	329,639.00			-
108c	Formation of Embankment from Borrow Excavation in Common Material	C.M	4,242,449.00			-
108d	Formation of Embankment from Structural Excavation in Common Material	C.M	115,891.00			-
109a	Subgrade Preparation in Earth Cut	S.M	237,314.00			-
110	Improved Subgrade (having 25% CBR)	C.M	587,327.00			-
SP-117a	Formation of granular material platform	C.M	17,325.00			-
SP-117b	Formation of Earthen Dowels	C.M	18,980.00			-
	<b>TOTAL FOR BILL NO.1 CARRIED TO SUMMARY</b>					-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

**BILL NO. 2 : SUBBASE & BASE**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
201	Granular Subbase	C.M	447,485.00			-
201a	Re-use of salvaged Granular Material from existing road as subbase	C.M	76,573.35			-
202	Aggregate Base Course	C.M	335,601.00			-
203b	Asphaltic Base Course Plant mix (Class B)	C.M	193,625.00			-
209a	Breaking of Existing Road Pavement Structure	C.M	121,550.00			-
209b	Scarification of Existing Road Pavement	S.M	2,500.00			-
<b>TOTAL FOR BILL NO.2 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

**BILL NO. 3 : SURFACE COURSES & PAVEMENT**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
302a	Cut -Back Asphalt for Bituminous Prime Coat	S.M	1,255,772.00			-
303a	Cut -Back Asphalt for Bituminous Tack Coat	S.M	2,376,881.00			-
304c	Triple Surface Treatment	S.M	476,184.00			-
305a	Asphaltic Concrete for Wearing Course (Class "A")	C.M	59,963.00			-
<b>TOTAL FOR BILL NO.3 CARRIED TO SUMMARY</b>						





**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

**BILL NO. 4.1 : STRUCTURE (BRIDGES)**

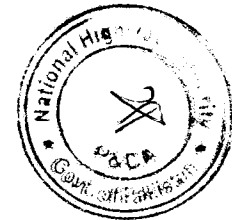
Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
107 a	Structural Excavation in Common Material	C.M	661.50			-
107 d	Granular Backfill	C.M	-			-
107 e	Common Backfill	C.M	330.75			-
401 f	Lean Concrete	C.M	187.95			-
401 a3i	Concrete Class A3 (Underground)	C.M	4,173.75			-
402 a3ii	Concrete Class A3 (On ground)	C.M	2,282.93			-
403 a3iii	Concrete Class A3 (Elevated)	C.M	10,320.68			-
401 d	Concrete Class D1 (5000 psi)	C.M	2,263.80			-
404 b	Reinforcement as Per AASHTO M.31Grade 60	TON	2,677.34			-
407 d1	Cast in place piles upto 1.0 m normal soil (Boring Only)	M	8,316.00			-
407 d2	Cast in place piles upto 1.0 m gravel strata (Boring Only)	M	2,079.00			-
407 d3	Cast in place piles upto 1.1 to 1.5 m normal soil (Boaring Only)	M	-			-
407 d4	Cast in place piles upto 1.1 to 1.5 m gravel strata (Boaring Only)	M	-			-
405 a	Prestressing wire strand, 3/8" - 1/2" dia, complete in all respect	TON	27.09			-
405 b	Launching of Prestressed Girders of any size or shaps	TON	5,455.40			-
407 l	Pile load test upto 800 ton (2.5 time the design load)	Each	18.00			-
407 k	Pile proof test upto 550 *on (1.5 time the design load)	Each	18.00			-
407 n	Permanent Pile Casing for Pile (10mm thick)	Ton	421.34			-
SP-415	Sonic Integrity Tests (SIT)	Each	84.00			-
SP-416	Manufactured Trade Marks expansion joints to roadway (25-30) mm movement	M	529.20			-
406 ei	Elastomeric Bearing Pads (according to size and thickness) below girders - USA/EU make	C.cm	502,135.20			-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

406 a	Premoulded Joint Filler with bitumastic joints seals	SM	264.60				-
507a	Steel Wire Mesh for Gabion	Kg.	10,451.74				-
507b	Rock Fill in Gabion	CM	1,659.00				-
SP-418	100 mm dia GI drain pipe	M	388.00				-
509 d	Grouted Rip Rap (Class A)	C.M	414.75				-
509 e	Grouted Rip Rap (Class B)	C.M	829.50				-
SP-417	Bitumen Coatings to Cement or Concrete surface using 0.60 kg/sq.m.	S.M	236.25				-
604a	Metal Guard Rail (Either Side of Bridge)	M	1,102.50				-
<b>TOTAL FOR BILL NO. 4.1 CARRIED TO SUMMARY</b>							-

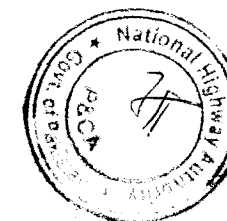


**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

**BILL NO. 4.2 : STRUCTURE (BOX CULVERTS)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
107 a	Structural Excavation in Common Material	C.M	16,145.97			-
107 d	Granular Backfill	C.M	17,802.00			-
107 e	Common Backfill	C.M	53,971.00			-
401 f	Lean Concrete	C.M	3,772.20			-
401 a3i	Concrete Class A3 (Underground)	C.M	7,527.43			-
402 a3ii	Concrete Class A3 (On ground)	C.M	24,795.48			-
403 a3iii	Concrete Class A3 (Elevated)	C.M	8,805.41			-
404 b	Reinforcement as Per AASHTO M.31 Grade 60	TON	6,457.15			-
406 d ii	PVC Water Stop 8 " Size	M	7,076.40			-
507a	Steel Wire Mesh for Gabion	Kg.	8,754.00			-
507b	Rock Fill in Gabion	CM	1,392.00			-
509 d	Grouted Rip Rap (Class A)	C.M	807.93			-
SP-417	Bitumen Coatings to Cement or Concrete surface using 0.60 kg/sq.m.	S.M	10,884.30			-
<b>TOTAL FOR BILL NO.4.2 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

**BILL NO. 4.3 : STRUCTURE (CATTLE CREEP)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
107 a	Structural Excavation in Common Material	C.M	6,746.00			-
107 d	Granular Backfill	C.M	2,180.00			-
107 e	Common Backfill	C.M	654.00			-
401 f	Lean Concrete	C.M	259.00			-
401 a3i	Concrete Class A3 (Underground)	C.M	169.00			-
402 a3ii	Concrete Class A3 (On ground)	C.M	1,705.00			-
403 a3iii	Concrete Class A3 (Elevated)	C.M	1,669.00			-
404 b	Reinforcement as Per AASHTO M.31Grade 60	TON	439.00			-
509 d	Grouted Rip Rap (Class A)	C.M	415.00			-
SP-417	Bitumen Coatings to Cement or Concrete surface using 0.60 kg/sq.m.	S.M	2,163.00			-
<b>TOTAL FOR BILL NO.4.3 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

**BILL NO. 4.4 : STRUCTURE (SUBWAYS)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
107 a	Structural Excavation in Common Material	C.M	13,378.00			-
107 d	Granular Backfill	C.M	4,014.00			-
107 e	Common Backfill	C.M	9,365.00			-
401 f	Lean Concrete	C.M	1,170.00			-
401 a3i	Concrete Class A3 (Underground)	C.M	386.00			-
402 a3ii	Concrete Class A3 (On ground)	C.M	4,491.00			-
403 a3iii	Concrete Class A3 (Elevated)	C.M	3,211.00			-
404 b	Reinforcement as Per AASHTO M.31 Grade 60	TON	1,002.00			-
509 d	Grouted Rip Rap (Class A)	C.M	620.00			-
SP-417	Bitumen Coatings to Cement or Concrete surface using 0.60 kg/sq.m.	S.M	4,718.00			-
SP-419	Steel Grating / Gully Grating Chamber (450 mm x 450 mm)	S.M	152.00			-
<b>TOTAL FOR BILL NO. 4.4 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

**BILL NO. 4.5 : STRUCTURE (PIPE CULVERTS)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
107 a	Structural Excavation in Common Material	C.M	188.00			-
107 d	Granular Backfill	C.M	242.00			-
107 e	Common Backfill	C.M	49.00			-
401 f	Lean Concrete	C.M	100.00			-
502 b	Concrete Class B in bedding and encasement of concrete pipe culvert	C.M	113.00			-
401 a3i	Concrete Class A3 (Underground)	C.M	9.00			-
402 a3ii	Concrete Class A3 (On ground)	C.M	116.00			-
403 a3iii	Concrete Class A3 (Elevated)	C.M	58.00			-
404 b	Reinforcement as Per AASHTO M.31Grade 60	TON	2.00			-
501 o	R.C.C. pipe culvert AASHTO M 170 class IV dia 910 mm	M	66.00			-
507a	Steel Wire Mesh for Gabion	Kg.	46.00			-
507b	Rock Fill in Gabion	CM	5.00			-
509 d	Grouted Rip Rap (Class A)	Cu. M	23.00			-
<b>TOTAL FOR BILL NO.4.5 CARRIED TO SUMMARY</b>						-

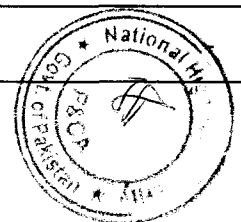


**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

**BILL NO 4.6 : STRUCTURES (SOIL INVESTIGATION FOR BRIDGES)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
SP-414 (a)	6" minimum dia drilling straight rotary/ Percussion including back filling of holes from NSL upto 45m depth or till the rock level, which ever is met earlier.	LM	1,152.00			-
SP-414(b)	Perform SPT at 1 m interval i/c collection, preservation & Transportation of disturbed samples to an approved Laboratory.	No.	864.00			-
SP-414(b-1)	Continuous core drilling in bedrock up to a maximum of 5 m depth below rock strike level, including termination of core recovery/ RQD, preservation of core samples in core boxes, labelling, waxing of selected core samples, photography of rock cores and transportation of core samples to the laboratory. In case core recovery is less than 80% reduce run length to 0.5 m.	LM	144.00			-
SP-414(c)	Collection of undisturbed soil samples from boreholes using Shelby pitcher/denison sampler i/c preservation and transportation of samples to an approved Laboratory.	No.	115.20			-
SP-414(d)	Performance of FDT in test pits through sand replacement method i/c moisture content determination.	No.	57.60			-
SP-414(e)	Excavation of testpits upto 1.5 m depth along road alignment including backfilling of pits to original condition.	M	43.20			-
SP-414(f)	Collection of undisturbed block samples from test pits at appropriate location as directed by the Engineer.	No.	28.80			-
SP-414(f1)	Collection of composite bulk sample (atleast 60 kg for sandy/clayey soils and 120 kg for gravely soils)	No.	28.80			-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

SP-414(g)	Collection & preservation of water samples from bore holes & transportation to an approved Laboratory.	No.	28.80				-
SP-414(h)	Laboratory Testing		-				-
i.	Grain size analysis.	No.	288.00				-
ii.	Hydrometer analysis.	No.	115.20				-
iii.	Atterberg limits	No.	115.20				-
iv.	Specific gravity	No.	43.20				-
v.	Natural moisture content	No.	129.60				-
vi.	Bulk density & Dry density (Soil/rock cores)	No.	129.60				-
vii.	Direct shear test	No.	57.60				-
viii.	Consolidation test (collapse/swell potential)	No.	28.80				-
ix.	Unconfined compression test (Soil/rock cores)	No.	100.80				-
x.	Chemical analysis of soil	No.	14.40				-
xi.	Chemical analysis of water	No.	28.80				-
xii.	Submission of Investigation Report (triplicate)	No.	14.40				-
xiii.	CBR	No.	28.80				-
xvi.	Modified Proctor Test	No.	28.80				-
<b>TOTAL FOR BILL NO.4.6 CARRIED TO SUMMARY</b>							-

Note: 1. Preferred method of drilling is straight rotary method. Percussion method will be allowed only if gravelly strata is encountered.

2. All soil/rock samples must be labeled, stored and transported as per ASTM. The area ratio and clearance ratio of the thin walled should be in strict compliance with relevant ASTM standard.





**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

**BILL NO. 5 : DRAINAGE AND EROSION WORKS**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
107 a	Structural Excavation in Common Material	C.M	5,544.00			-
107d	Granular Backfill	C.M	924.00			-
401a1ii	Concrete Class A1, (on Ground)	C.M	8,547.00			-
401a1iii	Concrete Class A1, (Elevated)	C.M	1,716.00			-
401 f	Lean Concrete	C.M	314.00			-
404 b	Reinforcement as per AASHTO M-31 Grade 60	TON	593.00			-
406 a	Premoulded Joint Filler 12mm thick with Bitumastic Joint Seal	S.M	11.00			-
406dii	PVC Waterstop 8" Size	L.M	858.00			-
501f	RCC Pipe Culvert AASHTO M 170 Class II dia 910mm	M	440.00			-
502b	Concrete Class B in bedding and Encasement of Concrete Pipe Culvert	C.M	359.00			-
509a	Rip Rap, Class "A"	CM	1,270.00			-
509d	Grouted Rip Rap, Class "A"	C.M	21,919.00			-
511a1	Dry Stone Pitching (15-20cm thick) with Bitumen Joints	S.M	4,440.00			-
511b1	Grouted Stone Pitching (15-20cm thick) with Bitumen Joints	S.M	4,400.00			-
510	Dismantling of Structure and Obstruction	C.M	1,100.00			-
<b>TOTAL FOR BILL NO.5 CARRIED TO SUMMARY</b>						-

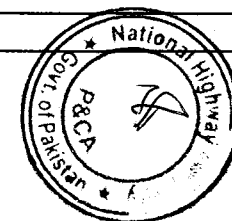


**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

**BILL NO. 6 : ANCILLARY WORKS**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
601ai	RCC New Jersey Barrier (In-Situ) for Median Double Face (Incl. Reinforcement)	M	63,250.00			-
601aii	RCC New Jersey Barrier (In-Situ) Single Face (Incl. Reinforcement)	M	34,700.00			-
601dii	Precast Curb in Concrete Class A-1 of Size 450 x 150 mm Incl. Bedding & Haunching	M	115,940.00			-
604a	Metal Guard Rail	M	6,800.00			-
604b	Guard Rail End Pieces	Each	40.00			-
604d	Steel Post for Guard Rail	Each	3,864.00			-
607a	Traffic Road Signs, Triangular Category - 1	Each	100.00			-
607b	Traffic Road Signs, Circular, Category - 2	Each	100.00			-
607e	Traffic Road Signs Rectangular Category - 3(c)	S.M	50.00			-
608 h2	Pavement Marking in Reflective TP Paint for line of 15cm width	M	334,041.00			-
608 j2	Pavement Marking in Reflective TP Paint for 4m Arrows	Each	550.00			-
609ci	Reflectorised Plastic Pavement Studs (Raised Profile Type - Single)	Each	28,528.00			-
611a	Galvanized Wire Mesh Fence 1500mm High Incl. Prestressed & RCC Posts Complete in all respects as per M-2 Standard	M	53,240.00			-
SP-614	Delineators/Angle Reflector	Each	23,000.00			-
SP-615a	Gantry Sign Type-I as shown on drawing	Each	6.00			-
SP-615b	Gantry Sign Type-II as shown on drawing	Each	6.00			-
<b>TOTAL FOR BILL NO. 6 CARRIED TO SUMMARY</b>						

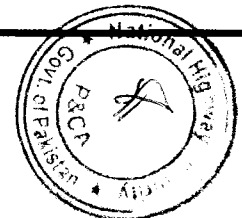


**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

**BILL NO. 7 : GENERAL ITEMS**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
SP-701a	Provide Surveying & allied instruments	PS	-	-		1,500,000
SP-701b	Maintain Survey Instruments, Including 2no. Helpers.	Month	24.00			
SP-702a	Provide the Employer's and Engineer's Representative's Office & Residence (on Rental Basis)	PS	-	-		3,000,000
SP-702b	Furnish and Equip. Employer's & Engineer's Representative office & Residence.	PS	-	-		5,000,000
SP-702c	Maintain Employer's and Engineer's Representative office and Residence.	Month	26.00			
SP-703a	Provide Material Testing Project Laboratory (1 Nos On Rental Basis)	PS	-	-		4,000,000
SP-703b	Equip & Furnish Material Testing Project Laboratory	PS	-	-		5,000,000
SP-703c	Maintain Material Testing Project Laboratory 1 Nos) including 4 No Helpers.	Month	26.00			
SP-708a	Provide Employer's Representative's Transport (1No)	PS	-	-		7,500,000
SP-708 b	Provide Engineer's Representative Transport.		-			
	(i) 4x4 Double Cabin 2800cc with A/C	Each	1.00			
	(ii) Car 1600cc With A/C	Each	-			
	(iii) Pickup Single Cabin with A/C	Each	-			
SP-708c	Running & Maintenance of Employer's & Engineer's Representative's Transport	Vehicle Month	281.00			
SP-715	Employing Trainee Engineer's with Boarding, Lodging and messing	Man Month	140.00			
	<b>TOTAL FOR BILL NO. 7 CARRIED TO SUMMARY</b>					

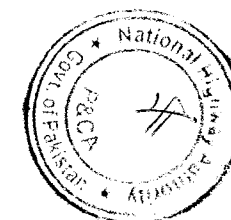


**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

**Bill No. 8 Electrical Works (Road Lighting Network based on LED Road Lighting Fixtures) 6 No. Interchange**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
	Design, supply, transportation, storage, installation, testing and commissioning of the following items of work, including all material, labour, tools and accessories etc. required for proper completion of each item as per specification, drawings and/or as directed by the Engineer.		-			-
SP-801(a)	10 m high single bent arm conical octagonal galvanized steel pole with extension arm luminaire arrangement, base plate, J-rag bolts, 2 Amp 01 No. SP MCB, pole numbering and earthing etc. as shown on drawing.	Each	140.00			-
SP-801(b)	10 m high double bent arm conical octagonal galvanized steel pole with extension arm luminaire arrangement, base plate, J-rag bolts, 2 Amp 02 Nos. SP MCB, pole numbering and earthing etc. as shown on drawing.	Each	82.00			-
SP-801(c)	12 m high double bent arm conical octagonal galvanized steel pole with extension arm luminaire arrangement, base plate, J-rag bolts, 2 Amp 02 Nos. SP MCB, pole numbering and earthing etc. as shown on drawing.	Each	178.00			-
SP-801(d)	Road Lighting Pole Foundation	Each	400.00			-
	<b><u>Road Lights &amp; Accessories for Flood Light Installation</u></b>					



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

SP-802(a)	Road Lighting LED Luminaries 90W make Signify (Philips), Schreder, Tungstram (GE) or equivalent suitable for M-2 & M-3 roads of wattage suitable for the project requirements, fully IP 66 with corrosion resistant die cast aluminum housing, silicon gas kit, thermally hardened glass complete with LED drivers, surge protection and all accessories/ components required for the proper operation of the system. The luminaries shall be fully flexible for future upgrades and easy replacements for maintenance purposes. Contractor to submit lighting design calculation as per the offered light fixtures.	No.	304.00			-
SP-802(b)	Road Lighting LED Luminaries 120W make Signify (Philips), Schreder, Tungstram (GE) or equivalent suitable for M-2 & M-3 roads of wattage suitable for the project requirements, fully IP 66 with corrosion resistant die cast aluminum housing, silicon gas kit, thermally hardened glass complete with LED drivers, surge protection and all accessories/ components required for the proper operation of the system. The luminaries shall be fully flexible for future upgrades and easy replacements for maintenance purposes. Contractor to submit lighting design calculation as per the offered light fixtures.	No.	356.00			-



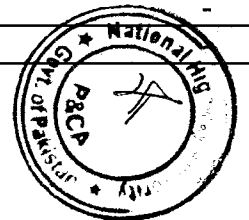
**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

SP-802(c)	Flood Lighting LED Luminaries 120W make Signify (Philips), Schreder, Tungsram (GE) or equivalent suitable for M-2 & M-3 roads of wattage suitable for the project requirements, fully IP 65 with corrosion resistant die cast aluminum housing, silicon gas kit, thermally hardened glass complete with LED drivers, surge protection and all accessories/ components required for the proper operation of the system. The luminaries shall be fully flexible for future upgrades and easy replacements for maintenance purposes. Contractor to submit lighting design calculation as per the offered light fixtures.	No.	24.00			-
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**Bill No. 8 Electrical Works (Road Lighting Network based on LED Road Lighting Fixtures) 6 No. Interchange**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
SP-802(d)	Hot dipped galvanized bracket for mounting of Flood lights alongwith all accessories.	Each	24.00			-
SP-802(e)	Junction box size 12"x08"x06" (for Flood Light connection) with angle iron frame claded 16 SWG, sheet steel enclosure having high quality powder coated paint, color RAL 7032. suitable for connections with IP 54 protection class, door, locking arrangement etc. and all other accessories as required for quality work.	No.	24.00			-
-	Junction box size 12"x08"x06" (for Flood Light connection)					-
-	01 No. 2 Amp. SP MCB, 10 kA					-
-	04 No. Terminal block					-
-	GI flexible pipe 1" dia					-
	<b>Conduits / Pipes</b>		-			-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

SP-803(a)	PVC pipe/conduit Class-D 50 mm dia with accessories suitable for laying multi-core cables in wall/structure.	Rm	240.00			-
SP-803(b)	PVC pipe/conduit Class-D 100 mm dia with accessories suitable for laying multi-core cables on road crossings.	Rm	2,700.00			-
SP-803(c)	PVC pipe/conduit Class-B 100 mm dia with accessories suitable for laying multi-core cables from pole to pole and in walls/structure.	Rm	13,900.00			-
	<b>Low Voltage Power Cables</b>		-			-
SP-804(a)	4 Core 25mm <sup>2</sup> Cu. PVC/PVC 600/1000 Voltage grade Unarmored Cable (Tranformer to LCP) (Imported copper shall be used. Verified documentary evidence for source of copper & PVC shall be furnished prior to manufacturing)	Rm	900.00			-
SP-804(b)	1 Core 25 mm <sup>2</sup> Cu. PVC 450/750 Voltage grade earth cable including all fixing accessories as required for earthing of lighting control panels.	Rm	120.00			-
SP-804(c)	4 Core 16mm <sup>2</sup> Cu. PVC/PVC 600/1000 Voltage grade Unarmored Cable (Imported copper shall be used. Verified documentary evidence for source of copper & PVC shall be furnished prior to manufacturing)	Rm	15,000.00			-
SP-804(d)	1 Core 16mm <sup>2</sup> Cu. PVC 450/750 Voltage grade Unarmored Cable (Imported copper shall be used. Verified documentary evidence for source of copper & PVC shall be furnished prior to manufacturing)	Rm	15,900.00			-
SP-804(e)	3 Nos. 1 core 2.5 mm <sup>2</sup> Cu/PVC 450/750 Voltage grade cable (stranded conductor) (Imported copper shall be used. Verified documentary evidence for source of copper & PVC shall be furnished prior to manufacturing) from junction box to the fitting through the hollow of pole.		-			-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

i	For 10m Pole	No.	304.00				-
ii	For 12m Pole	No.	356.00				-
iii	For Flood Lights	No.	24.00				-



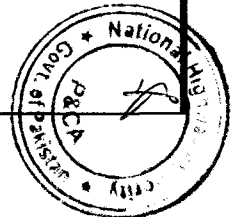


**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

**Bill No. 8 Electrical Works (Road Lighting Network based on LED Road Lighting Fixtures) 6 No. Interchange**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
SP-805	<p>Road lighting control panel with angle iron frame clad 14 SWG, sheet steel enclosure having high quality powder coated paint, color RAL 7032. The LCP shall be complete with incoming and outgoing MCCBs, Cu bus bars, magnetic contactors, photo-electric switches, meters, indication lights, construction with IP 54 protection class, door, locking arrangement etc. and all other accessories as required for quality work.</p> <p>MATERIAL</p> <p>1 No. incoming 63 Amp.(adj.) TP, MCCB, 25 kA                      4 No. outgoing 25 Amp. (adj.) TP MCCBs, 25 kA                      2 No. outgoing 25 Amp. (adj.) TP MCCBs, 25 kA (Spare)                      4 No. 32 Amp. magnetic contactor                      2 No. 32 Amp. magnetic contactor (Spare)                      3 No. photo-electric switches with timers and relays                      a) 1 No. ammeters 0-100 Amp, with selector switch (04 position) and CT of 100/5 Amp                      b) 3 No. indication lights                      c) 1 No. voltmeter with fuse and 7 position selector switch.                      d) 3 Ph, N &amp; Earth copper bus bars Internal wiring &amp; line-up terminals etc. Brass cable glands/accessories                      e) 06 Nos. Auto-Manual-OFF (3 position switches for operation in auto (with photocell) and normal (manual mode-photocell override)                      f) 06 Nos.ON &amp; 06 Nos. OFF push button switch's with indication lights                      g) Panel Light with limit Switch</p>	Job	6.00			



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising**

**of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

SP-806	Earth point comprising of 10 ft. 5/8" dia. (16 mm dia) copper coated M.S. rods driven in ground near each lighting control panel. The earthing rods shall be completed with fixing clamps etc.	Each	12.00			-
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**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

SP-807 As per WAPDA Specs.	Pole mounted transformer 25 kVA, 11/0.415 kV and all accessories, Installation and Connection Charges with energy meter as per WAPDA standards and practice.	Job	6.00				
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<b>Total of Bill No 8</b>							
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<b>Note:</b>	The cost of materials are inclusive of General Sales Tax (G.S.T)						
	The cost of security deposit and obtaining of 11 kV electrical connection with installation material from WAPDA shall be finalized as per site requirement and the cost for the same is not included in the above.						
	The above referred cost is for estimation purposes only and are based on budgetary quotations from the different manufacturers/suppliers. The final cost for the referred items shall be decided/finalized by the Client as per method of procurement i.e. open tendering, limited quotations from prequalified manufacturers/suppliers or any other.						

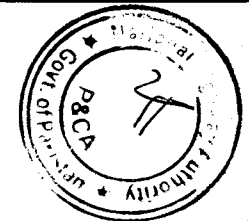


**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

The list of manufacturers/suppliers of different equipment/materials given as below in order to establish conformance of the product in accordance with the relevant International Standards as applicable. The contractor shall provide and fix the equipment/materials of brand new & superior quality as indicated below or approved equivalent as per approval of the Engineer/Employer

- LV and Control Cables: As per approved by Client
- PVC Conduit & Accessories: Beta, Popular, Galco
- G.I / MS Conduit & Accessories: Hilal Industries, ILL, Jamal, Pioneer
- MCCBs, MCB: Marlin Gerlin (MG) (France), Siemens (Germany), ABB (Italy), Legrand (France), Terasaki (Japan)
- Magnetic Contactors: ABB (Italy), Panasonic Green power (Japan), Telemecanique
- ACBs,, ELCBs: ABB (Italy), Siemens (Germany), MG (France) Terasaki (Japan)
- Photoelectric EE Switches: National Photoelectric EE Switches
- Relays and Timers: Finder (Italy), Inter (Turkey)
- LV Changeover switch: Socomec (France), ABB (France/Germany)
- Capacitors: Amber, Nokian
- Voltmeter/Ammeters: Circular (Italy), Revalco (Italy), Inter (Turkey), Entes (Turkey)



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-1: Rajanpur – Jampur Section [Km 0+000 to Km 57+500 (57.5 Km)]**

	<ul style="list-style-type: none"><li>- Current Transformer/Voltage</li><li>- Transformer: Circolor (Italy), Revalco (Italy), Fico</li><li>- Selector Switches/ Push button/Switches/switch socket: Kraus &amp; Naimer, ABB, Legrand, Clipsal Revalco (Italy)</li><li>- Indication Lamps: Legrand (France), Breter (Italy) ABB, Telemecanique</li><li>- Terminal Blocks: Legend (France), ABB, Phoenix, Cabour: Legrand (France), Breter (Italy) ABB, Telemecanique</li><li>- Cable Trays / Ladders: Bilal Industries Pvt. Ltd, Shaheen Corporation Pvt Ltd, AKS Engineering Pvt Ltd</li><li>- Wiring Accessories: Legrang &amp; Clipsal</li><li>- ATS/AMF Module and Battery Charger: DeepSea, Datakom</li><li>- Road Light Poles Jamal Pipe Industries, Bashir Pipe Industries</li><li>- Lighting Signify (Philips), Schreder, Tungsram (GE)</li></ul>		
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**ISLAMIC REPUBLIC OF PAKISTAN  
NATIONAL HIGHWAY AUTHORITY**



**OCB/CAREC/T-III:**

**Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 KM) from Two-Lane to Four-Lane Under one Package Comprising of Four Lots**

➤ *Lot-2: Jampur – DG Khan Section (64.0 Km)*

**BILL OF QUANTITIES**

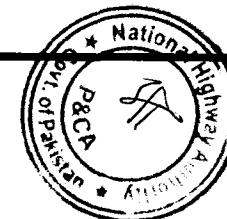


**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**  
**Lot-2: Jampur – DG Khan Section [Km 57+500 to Km 121+500 (64.0 Km)]**

**BILL OF QUNATITIES**

**SUMMARY**

S/NO	DESCRIPTION	TOTAL AMOUNT IN FIGURES (PKR)
1	EARTHWORK AND ALLIED ACTIVITIES	
2	SUB BASE & BASE	
3	SURFACE COURSES AND PAVEMENT	
4.1	STRUCTURES (BRIDGES)	
4.2	STRUCTURES (BOX CULVERTS)	
4.3	STRUCTURES (CATTLE CREEP)	
4.4	STRUCTURES (SUBWAYS)	
4.5	STRUCTURES (PIPE CULVERTS)	
4.6	STRUCTURES (SOIL INVESTIGATION FOR BRIDGES)	
5	DRAINAGE & EROSION WORKS	
6	ANCILLARY WORKS	
7	GENERAL ITEMS	
8	ELECTRICAL ITEMS	
	<b>TOTAL CONSTRUCTION COSTS</b>	



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-2: Jampur – DG Khan Section [Km 57+500 to Km 121+500 (64.0 Km)]**

**BILL OF QUANTITIES**

**BILL NO. 1 : EARTH WORK**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
101	Clearing and Grubbing	S.M	1,834,950.00			-
102a	Removal of Trees 150-300 mm Girth	Each	25.00			-
102b	Removal of Trees 301-600 mm Girth	Each	25.00			-
102c	Removal of Trees 601mm or over Girth	Each	15.00			-
104	Compaction of Natural Ground	S.M	1,834,950.00			-
106a	Excavate Unsuitable Common Material	C.M	13,960.00			-
108a	Formation of Embankment from Roadway Excavation in Common Material	C.M	390,021.25			-
108c	Formation of Embankment from Borrow Excavation in Common Material	C.M	5,328,678.98			-
108d	Formation of Embankment from Structural Excavation in Common Material	C.M	105,678.00			-
109a	Subgrade Preparation in Earth Cut	S.M	185,331.00			-
110	Improved Subgrade (having 25% CBR)	C.M	667,968.05			-
SP-117a	Formation of granular material platform	C.M	17,325.00			-
SP-117b	Formation of Earthen Dowels	C.M	21,120.00			-
	<b>TOTAL FOR BILL NO.1 CARRIED TO SUMMARY</b>					-





**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-2: Jampur – DG Khan Section [Km 57+500 to Km 121+500 (64.0 Km)]**

**BILL NO. 2 : SUBBASE & BASE**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
201	Granular Subbase	C.M	459,354.00			-
201a	Re-use of salvaged Granular Material from existing road as subbase	C.M	95,634.00			-
202	Aggregate Base Course	C.M	361,417.00			-
203b	Asphaltic Base Course Plant mix (Class B)	C.M	209,455.00			-
209a	Breaking of Existing Road Pavement Structure	C.M	151,800.00			-
209b	Scarification of Existing Road Pavement	S.M	2,500.00			-
<b>TOTAL FOR BILL NO.2 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-2: Jampur – DG Khan Section [Km 57+500 to Km 121+500 (64.0 Km)]**

**BILL NO. 3 : SURFACE COURSES & PAVEMENT**

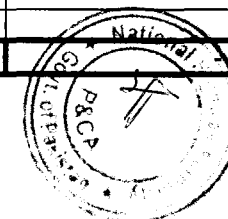
Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
302a	Cut -Back Asphalt for Bituminous Prime Coat	S.M	1,356,636.00			
303a	Cut -Back Asphalt for Bituminous Tack Coat	S.M	2,570,936.00			
304c	Triple Surface Treatment	S.M	500,990.00			
305a	Asphaltic Concrete for Wearing Course (Class "A")	C.M	64,749.00			
<b>TOTAL FOR BILL NO.3 CARRIED TO SUMMARY</b>						



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-2: Jampur – DG Khan Section [Km 57+500 to Km 121+500 (64.0 Km)]**

**BILL NO. 4.1 : STRUCTURE (BRIDGES)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
107 a	Structural Excavation in Common Material	C.M	18,081.00			-
107 d	Granular Backfill	C.M	2,596.65			-
107 e	Common Backfill	C.M	9,040.50			-
401 f	Lean Concrete	C.M	478.80			-
401 a3i	Concrete Class A3 (Underground)	C.M	16,222.50			-
402 a3ii	Concrete Class A3 (On ground)	C.M	10,889.62			-
403 a3iii	Concrete Class A3 (Elevated)	C.M	23,398.20			-
401 d	Concrete Class D1 (5000 psi)	C.M	7,562.10			-
404 b	Reinforcement as Per AASHTO M.31 Grade 60	TON	8,086.05			-
407 d1	Cast in place piles upto 1.0 m normal soil (Boaring Only)	M	22,339.80			-
407 d2	Cast in place piles upto 1.0 m gravel strata (Boaring Only)	M	5,584.95			-
407 d3	Cast in place piles upto 1.1 to 1.5 m normal soil (Boaring Only)	M	5,443.20			-
407 d4	Cast in place piles upto 1.1 to 1.5 m gravel strata (Boaring Only)	M	1,360.80			-
405 a	Prestressing wire strand, 3/8" - 1/2" dia, complete in all respect	TON	76.65			-
405 b	Launching of Prestressed Girders of any size or shaps	TON	18,224.85			-
407 l	Pile load test upto 800 ton (2.5 time the design load)	Each	32.00			-
407 k	Pile proof test upto 550 ton (1.5 time the design load)	Each	27.00			-
407 n	Permanent Pile Casing for Pile (10mm thick)	Ton	2,873.85			-
SP-415	Sonic Integrity Tests (SIT)	Each	552.30			-
SP-416	Manufactured Trade Marks expansion joints to roadway (25-30) mm movement	M	2,041.20			-
406 ei	Elastomeric Bearing Pads (according to size and thickness) below girders - USA/EU make	C.cm	1,780,380.00			-
406 a	Premoulded Joint Filler with bitumastic joints seals	SM	1,020.60			-
507a	Steel Wire Mesh for Gabion	Kg.	33,674.55			-
507b	Rock Fill in Gabion	CM	5,345.55			-
SP-418	100 mm dia GI drain pipe	M	1,974.00			-
509 d	Grouted Rip Rap (Class A)	C.M	1,336.65			-
509 e	Grouted Rip Rap (Class B)	C.M	2,673.30			-
SP-417	Bitumen Coatings to Cement or Concrete surface using 0.60 kg/sq.m.	S.M	10,332.00			-
604a	Metal Guard Rail (Either Side of Bridge)	M	2,467.50			-
<b>TOTAL FOR BILL NO. 4.1 CARRIED TO SUMMARY</b>						



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-2: Jampur – DG Khan Section [Km 57+500 to Km 121+500 (64.0 Km)]**

**BILL NO. 4.2 : STRUCTURE (BOX CULVERTS)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
107 a	Structural Excavation in Common Material	C.M	123,076.33			-
107 d	Granular Backfill	C.M	59,783.57			-
107 e	Common Backfill	C.M	39,540.02			-
401 f	Lean Concrete	C.M	3,115.80			-
401 a3i	Concrete Class A3 (Underground)	C.M	4,711.78			-
402 a3ii	Concrete Class A3 (On ground)	C.M	18,227.48			-
403 a3iii	Concrete Class A3 (Elevated)	C.M	3,971.90			-
404 b	Reinforcement as Per AASHTO M.31Grade 60	TON	4,225.05			-
406 d ii	PVC Water Stop 8 " Size	M	3,216.60			-
507a	Steel Wire Mesh for Gabion	Kg.	4,361.70			-
507b	Rock Fill in Gabion	CM	693.00			-
509 d	Grouted Rip Rap (Class A)	C.M	3,378.90			-
SP-417	Bitumen Coatings to Cement or Concrete surface using 0.60 kg/sq.m.	S.M	5,437.40			-
<b>TOTAL FOR BILL NO.4.2 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-2: Jampur – DG Khan Section [Km 57+500 to Km 121+500 (64.0 Km)]**

**BILL NO. 4.3 : STRUCTURE (CATTLE CREEP)**

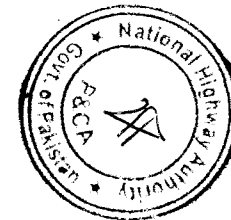
Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
107 a	Structural Excavation in Common Material	C.M	9,199.05			-
107 d	Granular Backfill	C.M	2,972.55			-
107 e	Common Backfill	C.M	892.50			-
401 f	Lean Concrete	C.M	353.85			-
401 a3i	Concrete Class A3 (Underground)	C.M	231.00			-
402 a3ii	Concrete Class A3 (On ground)	C.M	2,324.70			-
403 a3iii	Concrete Class A3 (Elevated)	C.M	2,276.40			-
404 b	Reinforcement as Per AASHTO M.31 Grade 60	TON	598.50			-
509 d	Grouted Rip Rap (Class A)	C.M	564.90			-
SP-417	Bitumen Coatings to Cement or Concrete surface using 0.60 kg/sq.m.	S.M	2,948.40			-
<b>TOTAL FOR BILL NO.4.3 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-2: Jampur – DG Khan Section [Km 57+500 to Km 121+500 (64.0 Km)]**

**BILL NO. 4.4 : STRUCTURE (SUBWAYS)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
107 a	Structural Excavation in Common Material	C.M	18,395.00			-
107 d	Granular Backfill	C.M	5,519.00			-
107 e	Common Backfill	C.M	12,878.00			-
401 f	Lean Concrete	C.M	1,609.00			-
401 a3i	Concrete Class A3 (Underground)	C.M	531.00			-
402 a3ii	Concrete Class A3 (On ground)	C.M	6,176.00			-
403 a3iii	Concrete Class A3 (Elevated)	C.M	4,416.00			-
404 b	Reinforcement as Per AASHTO M.31 Grade 60	TON	1,378.00			-
509 d	Grouted Rip Rap (Class A)	C.M	853.00			-
SP-417	Bitumen Coatings to Cement or Concrete surface using 0.60 kg/sq.m.	S.M	6,487.00			-
SP-419	Steel Grating / Gully Grating Chamber (450 mm x 450 mm)	SM	208.00			-
<b>TOTAL FOR BILL NO. 4.4 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-2: Jampur – DG Khan Section [Km 57+500 to Km 121+500 (64.0 Km)]**

**BILL NO. 4.5 : STRUCTURE (PIPE CULVERTS)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
107 a	Structural Excavation in Common Material	Cu. M	281.00			-
107 d	Granular Backfill	Cu. M	363.00			-
107 e	Common Backfill	Cu. M	73.00			-
401 f	Lean Concrete	Cu. M	150.00			-
502 b	Concrete Class B in bedding and encasement of concrete pipe culvert	Cu. M	169.00			-
401 a3i	Concrete Class A3 (Underground)	Cu. M	13.00			-
401 a3ii	Concrete Class A3 (On Ground)	Cu. M	174.00			-
401 a3iii	Concrete Class A3 (Elevated)	Cu. M	87.00			-
404 b	Reinforcement as Per AASHTO M.31Grade 60	TON	2.00			-
501 o	R.C.C. pipe culvert AASHTO M 170 class IV dia 910 mm	M	66.00			-
507a	Steel Wire Mesh for Gabion	Kg.	46.00			-
507b	Rock Fill in Gabion	CM	5.00			-
509 d	Grouted Rip Rap (Class A)	CM	23.00			-
<b>TOTAL FOR BILL NO.4.5 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-2: Jampur – DG Khan Section [Km 57+500 to Km 121+500 (64.0 Km)]**

**BILL NO 4.6 : STRUCTURES (SOIL INVESTIGATION FOR BRIDGES)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
SP-414(a)	6" minimum dia drilling straight rotary/ Percussion including back filling of holes from NSL upto 45m depth or till the rock level, which ever is met earlier.	LM	1,152.00			-
SP-414(b)	Perform SPT at 1 m interval i/c collection, preservation & Transportation of disturbed samples to an approved Laboratory.	No.	864.00			-
SP-414(b-1)	Continuous core drilling in bedrock up to a maximum of 5 m depth below rock strike level, including determination of core recovery/ RQD, preservation of core samples in core boxes, labelling, waxing of selected core samples, photography of rock cores and transportation of core samples to the laboratory. In case core recovery is less than 80% reduce run length to 0.5 m.	LM	144.00			-
SP-414(c)	Collection of undisturbed soil samples from boreholes using Shelby pitcher/denison sampler i/c preservation and transportation of samples to an approved Laboratory.	No.	115.20			-
SP-414(d)	Performance of FDT in test pits through sand replacement method i/c moisture content determination.	No.	57.60			-
SP-414(e)	Excavation of testpits upto 1.5 m depth along road alignment including backfilling of pits to original condition.	M	43.20			-
SP-414(f)	Collection of undisturbed block samples from test pits at appropriate location as directed by the Engineer.	No.	28.80			-
SP-414(f1)	Collection of composite bulk sample (atleast 60 kg for sandy/clayey soils and 120 kg for gravelly soils)	No.	28.80			-
SP-414(g)	Collection & preservation of water samples from bore holes & transportation to an approved Laboratory.	No.	28.80			-
SP-414(h)	Laboratory Testing		-			-
i.	Grain size analysis.	No.	288.00			-
ii.	Hydrometer analysis.	No.	115.20			-
iii.	Atterberg limits	No.	115.20			-
iv.	Specific gravity	No.	43.20			-
v.	Natural moisture content	No.	129.60			-
vi.	Bulk density & Dry density (Soil/rock cores)	No.	129.60			-
vii.	Direct shear test	No.	57.60			-
viii.	Consolidation test (collapse/swell potential)	No.	28.80			-
ix.	Unconfined compression test (Soil/rock cores)	No.	100.80			-
x.	Chemical analysis of soil	No.	14.40			-
xi.	Chemical analysis of water	No.	28.80			-





**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-2: Jampur – DG Khan Section [Km 57+500 to Km 121+500 (64.0 Km)]**

xii.	Submission of Investigation Report (triplicate)	No.	14.40			
xiii.	CBR	No.	28.80			
xvi.	Modified Proctor Test	No.	28.80			
<b>TOTAL FOR BILL NO.4.6 CARRIED TO SUMMARY</b>						-

Note: 1. Preferred method of drilling is straight rotary method. Percussion method will be allowed only if gravelly strata is encountered.  
2. All soil/rock samples must be labeled, stored and transported as per ASTM. The area ratio and clearance ratio of the thin walled should be in strict compliance with relevant ASTM standard.



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-2: Jampur – DG Khan Section [Km 57+500 to Km 121+500 (64.0 Km)]**

**BILL NO. 5 : DRAINAGE AND EROSION WORKS**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
107 a	Structural Excavation in Common Material	C.M	8,316.00			-
107d	Granular Backfill	C.M	1,386.00			-
401a1ii	Concrete Class A1, (on Ground)	C.M	9,614.00			-
401a1iii	Concrete Class A1, (Elevated)	C.M	2,574.00			-
401 f	Lean Concrete	C.M	471.00			-
404 b	Reinforcement as per AASHTO M-31 Grade 60	TON	743.00			-
406 a	Premoulded Joint Filler 12mm thick with Bitumastic Joint Seal	S.M	16.00			-
406dii	PVC Waterstop 8" Size	L.M	1,287.00			-
501f	RCC Pipe Culvert AASHTO M 170 Class II dia 910mm	M	440.00			-
502b	Concrete Class B in bedding and Encasement of Concrete Pipe Culvert	C.M	359.00			-
509a	Rip Rap, Class "A"	CM	1,170.00			-
509d	Grouted Rip Rap, Class "A"	C.M	17,346.00			-
511a1	Dry Stone Pitching (15-20cm thick) with Bitumen Joints	S.M	4,440.00			-
511b1	Grouted Stone Pitching (15-20cm thick) with Bitumen Joints	S.M	8,360.00			-
510	Dismantling of Structure and Obstruction	C.M	1,100.00			-
<b>TOTAL FOR BILL NO.5 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-2: Jampur – DG Khan Section [Km 57+500 to Km 121+500 (64.0 Km)]**

**BILL NO. 6 : ANCILLARY WORKS**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
601ai	RCC New Jersey Barrier (In-Situ) for Median Double Face (Incl. Reinforcement)	M	64,000.00			-
601aii	RCC New Jersey Barrier (In-Situ) Single Face (Incl. Reinforcement)	M	40,854.00			-
601dii	Precast Curb in Concrete Class A-1 of Size 450 x 150 mm Incl. Bedding & Haunching	M	122,474.00			-
604a	Metal Guard Rail	M	17,000.00			-
604b	Guard Rail End Pieces	Each	50.00			-
604d	Steel Post for Guard Rail	Each	9,232.00			-
607a	Traffic Road Signs, Triangular Category -1	Each	100.00			-
607b	Traffic Road Signs, Circular, Category - 2	Each	100.00			-
607e	Traffic Road Signs Rectangular Category - 3(c)	S.M	50.00			-
608 h2	Pavement Marking in Reflective TP Paint for line of 15cm width	M	362,179.00			-
608 j2	Pavement Marking in Reflective TP Paint for 4m Arrows	Each	660.00			-
609ci	Reflectorised Plastic Pavement Studs (Raised Profile Type - Single)	Each	30,814.00			-
611a	Galvanized Wire Mesh Fence 1500mm High Incl. Prestressed & RCC Posts Complete in all respects as per M-2 Standard	M	40,480.00			-
SP-614	Delineators/Angle Reflector	Each	25,600.00			-
SP-615a	Gantry Sign Type-I as shown on drawing	Each	10.00			-
SP-615b		Each	10.00			-
<b>TOTAL FOR BILL NO. 6 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-2: Jampur – DG Khan Section [Km 57+500 to Km 121+500 (64.0 Km)]**

**BILL NO. 7 : GENERAL ITEMS**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
SP-701a	Provide Surveying & allied instruments	PS				1,500,000
SP-701b	Maintain Survey Instruments, Including 2no. Helpers.	Month	24.00			-
SP-702a	Provide the Employer's and Engineer's Representative's Office & Residence (on Rental Basis)	PS				3,000,000
SP-702b	Furnish and Equip. Employer's & Engineer's Representative office & Residence.	PS				5,000,000
SP-702c	Maintain Employer's and Engineer's Representative office and Residence.	Month	26.00			-
SP-703a	Provide Material Testing Project Laboratory (1 Nos On Rental Basis)	PS				4,000,000
SP-703b	Equip & Furnish Material Testing Project Laboratory	PS				5,000,000
SP-703c	Maintain Material Testing Project Laboratory 1 Nos) including 4 No Helpers.	Month	26.00			-
SP-708a	Provide Employer's Representative's Transport (1No)	PS	-			7,500,000
SP-708 b	Provide Engineer's Representative Transport.		-			-
	(i) 4x4 Double Cabin 2800cc with A/C	Each	-			-
	(ii) Car 1600cc With A/C	Each	-			-
	(iii) Pickup Single Cabin with A/C	Each	2.00			-
SP-708c	Running & Maintenance of Employer's & Engineer's Representative's Transport	Vehicle Month	281.00			-
SP-715	Employing Trainee Engineer's with Boarding, Lodging and messing	Man Month	140.00			-
	<b>TOTAL FOR BILL NO. 7 CARRIED TO SUMMARY</b>					



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Lot-2: Jampur – DG Khan Section [Km 57+500 to Km 121+500 (64.0 Km)]**

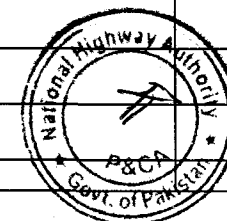
**Bill No. 8 Electrical Works (Road Lighting Network based on LED Road Lighting Fixtures) 5 No. Interchange**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
	Design, supply, transportation, storage, installation, testing and commissioning of the following items of work, including all material, labour, tools and accessories etc. required for proper completion of each item as per specification, drawings and/or as directed by the Engineer.					
SP-801(a)	10 m high single bent arm conical octagonal galvanized steel pole with extension arm luminaire arrangement, base plate, J-rag bolts, 2 Amp 01 No. SP MCB, pole numbering and earthing etc. as shown on drawing.	Each	112.00			
SP-801(b)	10 m high double bent arm conical octagonal galvanized steel pole with extension arm luminaire arrangement, base plate, J-rag bolts, 2 Amp 02 Nos. SP MCB, pole numbering and earthing etc. as shown on drawing.	Each	73.00			
SP-801(c)	12 m high double bent arm conical octagonal galvanized steel pole with extension arm luminaire arrangement, base plate, J-rag bolts, 2 Amp 02 Nos. SP MCB, pole numbering and earthing etc. as shown on drawing.	Each	160.00			
SP-801(d)	Road Lighting Pole Foundation	Each	345.00			
	<b><u>Road Lights &amp; Accessories for Flood Light Installation</u></b>					
SP-802(a)	Road Lighting LED Luminaries 90W make Signify (Philips), Schreder, Tungsram (GE) or equivalent suitable for M-2 & M-3 roads of wattage suitable for the project requirements, fully IP 66 with corrosion resistant die cast aluminum housing, silicon gas kit, thermally hardened glass complete with LED drivers, surge protection and all accessories/ components required for the proper operation of the system. The luminaries shall be fully flexible for future upgrades and easy replacements for maintenance purposes. Contractor to submit lighting design calculation as per the offered light fixtures.	No.	258.00			



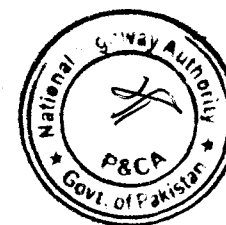
**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**  
**Lot-2: Jampur – DG Khan Section [Km 57+500 to Km 121+500 (64.0 Km)]**

SP-802(b)	Road Lighting LED Luminaries 120W make Signify (Philips), Schreder, Tungfram (GE) or equivalent suitable for M-2 & M-3 roads of wattage suitable for the project requirements, fully IP 66 with corrosion resistant die cast aluminum housing, silicon gas kit, thermally hardened glass complete with LED drivers, surge protection and all accessories/ components required for the proper operation of the system. The luminaries shall be fully flexible for future upgrades and easy replacements for maintenance purposes. Contractor to submit lighting design calculation as per the offered light fixtures.	No.	320.00			
SP-802(c)	Flood Lighting LED Luminaries 120W make Signify (Philips), Schreder, Tungfram (GE) or equivalent suitable for M-2 & M-3 roads of wattage suitable for the project requirements, fully IP 65 with corrosion resistant die cast aluminum housing, silicon gas kit, thermally hardened glass complete with LED drivers, surge protection and all accessories/ components required for the proper operation of the system. The luminaries shall be fully flexible for future upgrades and easy replacements for maintenance purposes. Contractor to submit lighting design calculation as per the offered light fixtures.	No.	20.00			
SP-802(d)	Hot dipped galvanized bracket for mounting of Flood lights alongwith all accessories.	Each	20.00			
SP-802(e)	Junction box size 12"x08"x06" (for Flood Light connection) with angle iron frame clad 16 SWG, sheet steel enclosure having high quality powder coated paint, color RAL 7032. suitable for connections with IP 54 protection class, door, locking arrangement etc. and all other accessories as required for quality work.	No.	20.00			
	- Junction box size 12"x08"x06" (for Flood Light connection)					
	- 01 No. 2 Amp. SP MCB, 10 kA					
	- 04 No. Terminal block					
	- GI flexible pipe 1" dia					
	<b>Conduits / Pipes</b>		-			
SP-803(a)	PVC pipe/conduit Class-D 50 mm dia with accessories suitable for laying multi-core cables in wall/structure.	Rm	200.00			
SP-803(b)	PVC pipe/conduit Class-D 100 mm dia with accessories suitable for laying multi-core cables on road crossings.	Rm	2,300.00			
SP-803(c)	PVC pipe/conduit Class-B 100 mm dia with accessories suitable for laying multi-core cables from pole to pole and in walls/structure.	Rm	11,700.00			
	<b>Low Voltage Power Cables</b>		-			



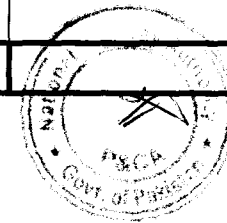
**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
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SP-804(a)	4 Core 25mm <sup>2</sup> Cu. PVC/PVC 600/1000 Voltage grade Unarmored Cable (Transformer to LCP) (Imported copper shall be used. Verified documentary evidence for source of copper & PVC shall be furnished prior to manufacturing)	Rm	800.00			
SP-804(b)	1 Core 25 mm <sup>2</sup> Cu. PVC 450/750 Voltage grade earth cable including all fixing accessories as required for earthing of lighting control panels.	Rm	100.00			
SP-804(c)	4 Core 16mm <sup>2</sup> Cu. PVC/PVC 600/1000 Voltage grade Unarmored Cable (Imported copper shall be used. Verified documentary evidence for source of copper & PVC shall be furnished prior to manufacturing)	Rm	12,500.00			
SP-804(d)	1 Core 16mm <sup>2</sup> Cu. PVC 450/750 Voltage grade Unarmored Cable (Imported copper shall be used. Verified documentary evidence for source of copper & PVC shall be furnished prior to manufacturing)	Rm	13,300.00			
SP-804(e)	3 Nos. 1 core 2.5 mm <sup>2</sup> Cu/PVC 450/750 Voltage grade cable (stranded conductor) (Imported copper shall be used. Verified documentary evidence for source of copper & PVC shall be furnished prior to manufacturing) from junction box to the fitting through the hollow of pole.					
i	For 10m Pole	No.	258.00			
ii	For 12m Pole	No.	320.00			
iii	For Flood Lights	No.	20.00			



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SP-805	<p>Road lighting control panel with angle iron frame clad 14 SWG, sheet steel enclosure having high quality powder coated paint, color RAL 7032. The LCP shall be complete with incoming and outgoing MCCBs, Cu bus bars, magnetic contactors, photo-electric switches, meters, indication lights, construction with IP 54 protection class, door, locking arrangement etc. and all other accessories as required for quality work.</p> <p><b>MATERIAL</b></p> <p>1 No. incoming 63 Amp.(adj.) TP, MCCB, 25 kA          4 No. outgoing 25 Amp. (adj.) TP MCCBs, 25 kA          2 No. outgoing 25 Amp. (adj.) TP MCCBs, 25 kA (Spare)          4 No. 32 Amp. magnetic contactor          2 No. 32 Amp. magnetic contactor (Spare)          3 No. photo-electric switches with timers and relays          a) 1 No. ammeters 0-100 Amp, with selector switch (04 position) and CT of 100/5 Amp          b) 3 No. indication lights          c) 1 No. voltmeter with fuse and 7 position selector switch.          d) 3 Ph, N &amp; Earth copper bus bars Internal wiring &amp; line-up terminals etc. Brass cable glands/accessories          e) 06 Nos. Auto-Manual-OFF (3 position switches for operation in auto (with photocell) and normal (manual mode-photocell override)          f) 06 Nos.ON &amp; 06 Nos. OFF push button switch's with indication lights          g) Panel Light with limit Switch</p>	Job	5			
SP-806	<p>Earth point comprising of 10 ft. 5/8" dia. (16 mm dia) copper coated M.S. rods driven in ground near each lighting control panel. The earthing rods shall be completed with fixing clamps etc.</p>	Each	10			
SP-807 As per WAPDA Specs.	<p>Pole mounted transformer 25 kVA, 11/0.415 kV and all accessories, Installation and Connection Charges with energy meter as per WAPDA standards and practice.</p>	Job	5			
<b>Total of Bill No 8</b>						





**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-2: Jampur – DG Khan Section [Km 57+500 to Km 121+500 (64.0 Km)]**

**Note:** The cost of materials are inclusive of General Sales Tax (G.S.T)

The cost of security deposit and obtaining of 11 kV electrical connection with installation material from WAPDA shall be finalized as per site requirement and the cost for the same is not included in the above.

The above referred cost is for estimation purposes only and are based on budgetary quotations from the different manufacturers/suppliers. The final cost for the referred items shall be decided/finalized by the Client as per method of procurement i.e. open tendering, limited quotations from prequalified manufacturers/suppliers or any other.

The list of manufacturers/suppliers of different equipment/materials given as below in order to establish conformance of the product in accordance with the relevant International Standards as applicable. The contractor shall provide and fix the equipment/materials of brand new & superior quality as indicated below or approved equivalent as per approval of the Engineer/Employer

- LV and Control Cables: As per approved by Client
- PVC Conduit & Accessories: Beta, Popular, Galco
- G.I / MS Conduit & Accessories: Hilal Industries, IIL, Jamal, Pioneer
- MCCBs, MCB: Marlin Gerlin (MG) (France), Siemens (Germany), ABB (Italy), Legrand (France), Terasaki (Japan)
- Magnetic Contactors: ABB (Italy), Panasonic Green power(Japan), Telemecanique
- ACBs,, ELCBs: ABB (Italy), Siemens (Germany), MG (France) Terasaki (Japan)
- Photoelectric EE Switches: National Photoelectric EE Switches
- Relays and Timers: Finder (Italy), Inter (Turkey)
- LV Changeover switch: Socomec (France), ABB (France/Germany)
- Capacitors: Amber, Nokian
- Voltmeter/Ammeters: Circulor (Italy), Revalco (Italy), Inter (Turkey), Entes (Turkey)
- Current Transformer/Voltage
- Transformer: Circulor (Italy), Revalco (Italy), Fico
- Selector Switches/ Push button/switches/switch socket: Kraus & Naimer, ABB, Legrand, Clipsal Revalco (Italy)
- Indication Lamps: Legrand (France), Breter (Italy) ABB, Telemecanique
- Terminal Blocks: Legend (France), ABB, Phoenix, Cabour: Legrand (France), Breter (Italy) ABB, Telemecanique
- Cable Trays / Ladders: Bilal Industries Pvt. Ltd, Shaheen Corporation Pvt Ltd, AKS Engineering Pvt Ltd
- Wiring Accessories: Legrang & Clipsal
- ATS/AMF Module and Battery Charger: DeepSea, Datakom
- Road Light Poles Jamal Pipe Industries, Bashir Pipe Industries
- Lighting Signify (Phillips), Schreder, Tungsram (GE)



**ISLAMIC REPUBLIC OF PAKISTAN  
NATIONAL HIGHWAY AUTHORITY**

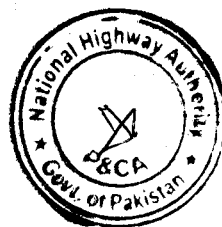


**OCB/CAREC/T-III:**

**Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 KM) from Two-Lane to Four-Lane Under one Package Comprising of Four Lots**

- *Lot-3: DG Khan to Tibi Qaisrani via Shahdan Lund Section (111.70 Km)*

**BILL OF QUANTITIES**

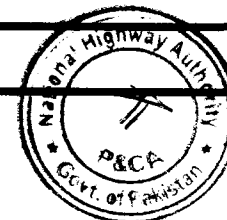


**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**  
**Lot-3: DG Khan – Tibi Qaisrani via Shahdan Lund Section [Km 121+500 to Km 233+200 (111.70 Km)]**

**BILL OF QUNATITIES**

**SUMMARY**

S/NO	DESCRIPTION	TOTAL AMOUNT IN FIGURES (PKR)
1	EARTHWORK AND ALLIED ACTIVITIES	
2	SUB BASE & BASE	
3	SURFACE COURSES AND PAVEMENT	
4.1	STRUCTURES (BRIDGES)	
4.2	STRUCTURES (BOX CULVERTS)	
4.3	STRUCTURES (CATTLE CREEP)	
4.4	STRUCTURES (SUBWAYS)	
4.5	STRUCTURES (PIPE CULVERTS)	
4.6	STRUCTURES (SOIL INVESTIGATION FOR BRIDGES)	
5	DRAINAGE & EROSION WORKS	
6	ANCILLARY WORKS	
7	GENERAL ITEMS	
8	ELECTRICAL ITEMS	
	<b>TOTAL CONSTRUCTION COSTS</b>	

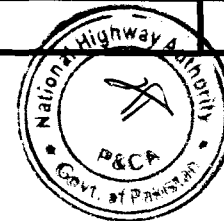


**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-3: DG Khan – Tibi Qaisrani via Shahdan Lund Section [Km 121+500 to Km 233+200 (111.70 Km)]**

**BILL OF QUNATITIES**

**BILL NO. 1 : EARTH WORK**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs.)
101	Clearing and Grubbing	S.M	1,917,440.00			-
102a	Removal of Trees 150-300 mm Girth	Each	90.00			-
102b	Removal of Trees 301-600 mm Girth	Each	90.00			-
102c	Removal of Trees 601mm or over Girth	Each	50.00			-
104	Compaction of Natural Ground	S.M	1,917,440.00			-
106a	Excavate Unsuitable Common Material	C.M	66,220.79			-
108a	Formation of Embankment from Roadway Excavation in Common Material	C.M	673,072.73			-
108c	Formation of Embankment from Borrow Excavation in Common Material	C.M	5,541,046.53			-
108d	Formation of Embankment from Structural Excavation in Common Material	C.M	259,022.00			-
109a	Subgrade Preparation in Earth Cut	S.M	879,857.00			-
110	Improved Subgrade (having 25% CBR)	C.M	1,141,560.00			-
SP-117a	Formation of granular material platform	C.M	60,000.00			-
SP-117b	Formation of Earthen Dowels	C.M	40,170.00			-
<b>TOTAL FOR BILL NO.1 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
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BILL NO. 2 : SUBBASE & BASE						
Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs.)
201	Granular Subbase	C.M	794,960.00			-
201a	Re-use of salvaged Granular Material from existing road as subbase	C.M	195,727.60			-
202	Aggregate Base Course	C.M	646,616.00			-
203b	Asphaltic Base Course Plant mix (Class B)	C.M	322,940.00			-
209a	Breaking of Existing Road Pavement Structure	C.M	362,600.00			-
209b	Scarification of Existing Road Pavement	S.M	2,500.00			-
<b>TOTAL FOR BILL NO.2 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-3: DG Khan – Tibi Qaisrani via Shahdan Lund Section [Km 121+500 to Km 233+200 (111.70 Km)]**

**BILL NO. 3 : SURFACE COURSES & PAVEMENT**

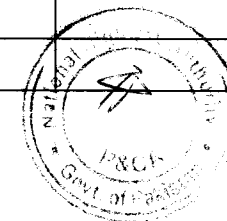
Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs.)
302a	Cut -Back Asphalt for Bituminous Prime Coat	S.M	2,383,834.00			-
303a	Cut -Back Asphalt for Bituminous Tack Coat	S.M	4,543,152.00			-
304c	Triple Surface Treatment	S.M	920,000.00			-
305a	Asphaltic Concrete for Wearing Course (Class "A")	C.M	114,917.00			-
<b>TOTAL FOR BILL NO.3 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-3: DG Khan – Tibi Qaisrani via Shahdan Lund Section [Km 121+500 to Km 233+200 (111.70 Km)]**

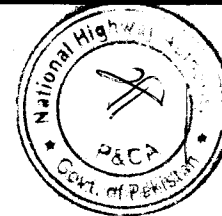
**BILL NO. 4.1 : STRUCTURE (BRIDGES)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs.)
107 a	Structural Excavation in Common Material	C.M	58,210.25			-
107 d	Granular Backfill	C.M	14,442.00			-
107 e	Common Backfill	C.M	38,320.00			-
401 f	Lean Concrete	C.M	802.59			-
401 a3i	Concrete Class A3 (Underground)	C.M	34,301.26			-
401 a3ii	Concrete Class A3 (On ground)	C.M	12,490.31			-
401 a3iii	Concrete Class A3 (Elevated)	C.M	25,534.46			-
401 d	Concrete Class D1 (5000 psi)	C.M	20,636.23			-
404 b	Reinforcement as Per AASHTO M.31Grade 60	TON	14,595.08			-
407 d1	Cast in place piles upto 1.0 m normal soil (Boaring Only)	M	9,012.00			-
407 d2	Cast in place piles upto 1.0 m gravel strata (Boaring Only)	M	2,254.00			-
407 d3	Cast in place piles upto 1.1 to 1.5 m normal soil (Boaring Only)	M	28,264.00			-
407 d4	Cast in place piles upto 1.1 to 1.5 m gravel strata (Boaring Only)	M	9,062.00			-
405 a	Prestressing wire strand, 3/8" - 1/2" dia, complete in all respect	TON	507.63			-
405 b	Launching of Girders	TON	49,526.95			-
407 l	Pile load test upto 800 ton (2.5 time the design load)	Each	35.00			-
407 k	Pile proof test upto 550 ton (1.5 time the design load)	Each	34.00			-
407 n	Permanent Pile Casing for Pile (10mm thick)	Ton	2,002.21			-
SP-415	Sonic Integrity Tests (SIT)	Each	1,722.00			-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
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SP-416	Manufactured Trade Marks expansion joints to roadway (25-30) mm movement	M	3,302.00			
406 ei	Elastomeric Bearing Pads (according to size and thickness) below girders - USA/EU make	C.cm	2,645,055.00			
406 a	Premoulded Joint Filler 12 Mm Thick With Bitumastic Joint Seal	S.M	2,798.00			
507 a	Steel Wire Mesh for Gabion	Kg	173,702.00			
507 b	Rockfill in Gabion	Cu.M	19,962.00			
SP-418	100 mm dia GI drain pipe	M	2,086.00			
509 d	Grouted Rip Rap (Class A)	CM	2,373.00			
509 e	Grouted Rip Rap (Class B)	CM	7,488.00			
SP-417	Bitumen Coatings to Cement or Concrete surface using 0.60 kg/sq.m.	S.M	2,532.00			
604a	Metal Guard Rail (Either Side of Bridge)	M	13,740.00			
<b>TOTAL FOR BILL NO.4.1 CARRIED TO SUMMARY</b>						





**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-3: DG Khan – Tibi Qaisrani via Shahdan Lund Section [Km 121+500 to Km 233+200 (111.70 Km)]**

**BILL NO. 4.2 : STRUCTURE (BOX CULVERTS)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs.)
107 a	Structural Excavation in Common Material	C.M	319,306.45			-
107 d	Granular Backfill	C.M	180,708.15			-
107 e	Common Backfill	C.M	115,883.36			-
401 f	Lean Concrete	C.M	7,023.24			-
401 a3i	Concrete Class A3 (Underground)	C.M	13,955.99			-
401 a3ii	Concrete Class A3 (4000 psi) On Ground	C.M	48,125.51			-
401 a3iii	Concrete Class A3 (4000 psi) Elevated	C.M	22,944.09			-
404 b	Reinforcement as Per AASHTO M.31 Grade 60	TON	13,349.02			-
406 d ii	PVC Water Stop 8 " Size	M	10,965.60			-
507a	Steel Wire Mesh for Gabion	Kg.	6,555.60			-
507b	Rock Fill in Gabion	CM	1,053.60			-
509 d	Grouted Rip Rap (Class A)	C.M	3,460.30			-
SP-417	Bitumen Coatings to Cement or Concrete surface using 0.60 kg/sq.m.	S.M	17,747.13			-
<b>TOTAL FOR BILL NO.4.2 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-3: DG Khan – Tibi Qaisrani via Shahdan Lund Section [Km 121+500 to Km 233+200 (111.70 Km)]**

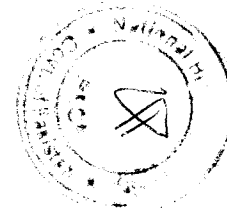
**BILL NO. 4.3 : STRUCTURE (CATTLE CREEP)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs.)
107 a	Structural Excavation in Common Material	C.M	7,250.00			-
107 d	Granular Backfill	C.M	2,412.00			-
107 e	Common Backfill	C.M	724.00			-
401 f	Lean Concrete	C.M	273.00			-
401 a3i	Concrete Class A3 (Underground)	C.M	179.00			-
401 a3ii	Concrete Class A3 (On ground)	C.M	1,787.00			-
401 a3iii	Concrete Class A3 (Elevated)	C.M	1,750.00			-
404 b	Reinforcement as Per AASHTO M.31Grade 60	TON	461.00			-
509 d	Grouted Rip Rap (Class A)	C.M	435.00			-
SP-417	Bitumen Coatings to Cement or Concrete surface using 0.60 kg/sq.m.	S.M	2,266.00			-
<b>TOTAL FOR BILL NO.4.3 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
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<b>BILL NO. 4.4 : STRUCTURE (SUBWAYS)</b>						
<b>Item No.</b>	<b>Description</b>	<b>Unit</b>	<b>Quantity</b>	<b>Rate in Figures</b>	<b>Rate in Words</b>	<b>Amount (Rs.)</b>
107 a	Structural Excavation in Common Material	C.M	28,414.00			-
107 d	Granular Backfill	C.M	8,526.00			-
107 e	Common Backfill	C.M	1,990.00			-
401 f	Lean Concrete	C.M	2,393.00			-
401 a3i	Concrete Class A3 (Underground)	C.M	748.00			-
401 a3ii	Concrete Class A3 (On ground)	C.M	8,494.00			-
401 a3iii	Concrete Class A3 (Elevated)	C.M	6,466.00			-
404 b	Reinforcement as Per AASHTO M.31Grade 60	TON	1,946.00			-
509 d	Grouted Rip Rap (Class A)	C.M	1,243.00			-
SP-417	Bitumen Coatings to Cement or Concrete surface using 0.60 kg/sq.m.	S.M	8,313.00			-
SP-419	Steel Grating / Gully Grating Chamber (450 mm x 450 mm)	SM	622.00			-
<b>TOTAL FOR BILL NO. 4.4 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-3: DG Khan – Tibi Qaisrani via Shahdan Lund Section [Km 121+500 to Km 233+200 (111.70 Km)]**

**BILL NO. 4.5 : STRUCTURE (PIPE CULVERTS)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs.)
107 a	Structural Excavation in Common Material	C.M	2,999.00			-
107 d	Granular Backfill	C.M	2,282.00			-
107 e	Common Backfill	C.M	2,400.00			-
401 f	Lean Concrete	C.M	555.00			-
502 b	Concrete Class B in bedding and encasement of concrete pipe culvert	C.M	6,179.00			-
401 a3i	Concrete Class A3 (Underground)	C.M	36.00			-
401 a3ii	Concrete Class A3 (On ground)	C.M	192.00			-
401 a3iii	Concrete Class A3 (Elevated)	C.M	390.00			-
404 b	Reinforcement as Per AASHTO M.31 Grade 60	TON	6.00			-
501 o	R.C.C. pipe culvert AASHTO M 170 class IV dia 910 mm	M	146.00			-
509 d	Grouted Rip Rap (Class A)	C.M	318.00			-
<b>TOTAL FOR BILL NO.4.5 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
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**BILL NO 4.6 STRUCTURES( SOIL INVESTIGATION FOR BRIDGES)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs.)
SP-414 (a)	6" minimum dia drilling straight rotary/ Percussion including back filling of holes from NSL upto 45m depth or till the rock level, which ever is met earlier.	LM	5,490.00			
SP-414(b)	Perform SPT at 1 m interval i/c collection, preservation & Transportation of disturbed samples to an approved Laboratory.	No.	2,440.00			
SP-414(b-1)	Continuous core drilling in bedrock up to a maximum of 5 m depth below rock strike level, including termination of core recovery/ RQD, preservation of core samples in core boxes, labelling, waxing of selected core samples, photography of rock cores and transportation of core samples to the laboratory. In case core recovery is less than 80% reduce run length to 0.5 m.	LM	610.00			
SP-414(c)	Collection of undisturbed soil samples from boreholes using Shelby pitcher/denison sampler i/c preservation and transportation of samples to an approved Laboratory.	No.	366.00			
SP-414(d)	Performance of FDT in test pits through sand replacement method i/c moisture content determination.	No.	366.00			
SP-414(e)	Excavation of testpits upto 1.5 m depth along road alignment including backfilling of pits to original condition.	M	366.00			
SP-414(f)	Collection of undisturbed block samples from test pits at appropriate location as directed by the Engineer.	No.	366.00			
SP-414(f1)	Collection of composite bulk sample (atleast 60 kg for sandy/clayey soils and 120 kg for gravelly soils)	No.	122.00			
SP-414(g)	Collection & preservation of water samples from bore holes & transportation to an approved Laboratory.	No.	244.00			
SP-414(h)	Laboratory Testing					
i.	Grain size analysis.	No.	748.80			
ii.	Hydrometer analysis.	No.	299.00			
iii.	Atterberg limits	No.	299.00			
iv.	Specific gravity	No.	111.80			
v.	Natural moisture content	No.	335.40			
vi.	Bulk density & Dry density (Soil/rock cores)	No.	335.40			
vii.	Direct shear test	No.	150.80			
viii.	Consolidation test (collapse/swell potential)	No.	75.40			
ix.	Unconfined compression test (Soil/rock cores)	No.	260.00			
x.	Chemical analysis of soil	No.	39.00			
xi.	Chemical analysis of water	No.	75.40			
xii.	Submission of Investigation Report (triplicate)	No.	39.00			
xiii.	CBR	No.	75.40			
xvi.	Modified Proctor Test	No.	75.40			



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	<b>TOTAL FOR BILL NO.4.6 CARRIED TO SUMMARY</b>				
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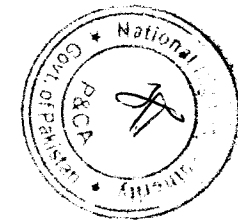
Note: 1. Preferred method of drilling is straight rotary method. Percussion method will be allowed only if gravelly strata is encountered.  
2. All soil/rock samples must be labeled, stored and transported as per ASTM. The area ratio and clearance ratio of the thin walled should be in strict compliance with relevant ASTM standard.



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**BILL NO. 5 : DRAINAGE AND EROSION WORKS**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs.)
107 a	Structural Excavation in Common Material	C.M	22,176.00			-
107d	Granular Backfill	C.M	3,696.00			-
401a1ii	Concrete Class A1, (on Ground)	C.M	23,182.00			-
401a1iii	Concrete Class A1, (Elevated)	C.M	6,864.00			-
401 f	Lean Concrete	C.M	1,255.00			-
404 b	Reinforcement as per AASHTO M-31 Grade 60	TON	1,714.00			-
406 a	Premoulded Joint Filler 12mm thick with Bitumastic Joint Seal	S.M	42.00			-
406dii	PVC Waterstop 8" Size	L.M	3,432.00			-
501f	RCC Pipe Culvert AASHTO M 170 Class II dia 910mm	M	2,750.00			-
502b	Concrete Class B in bedding and Encasement of Concrete Pipe Culvert	C.M	2,238.00			-
509a	Rip Rap, Class "A"	CM	950.00			-
509d	Grouted Rip Rap, Class "A"	C.M	40,122.00			-
510	Dismantling of Structure and Obstruction	C.M	15,400.00			-
511a1	Dry Stone Pitching (15-20cm thick) with Bitumen Joints	S.M	43,670.00			-
511b1	Grouted Stone Pitching (15-20cm thick) with Bitumen Joints	S.M	66,000.00			-
<b>TOTAL FOR BILL NO.5 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
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**BILL NO. 6 : ANCILLARY WORKS**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs.)
601ai	RCC New Jersey Barrier (In-Situ) for Median Double Face (Incl. Reinforcement)	M	112,950.00			-
601aii	RCC New Jersey Barrier (In-Situ) Single Face (Incl. Reinforcement)	M	44,820.00			-
601dii	Precast Curb in Concrete Class A-1 of Size 450 x 150 mm Incl. Bedding & Haunching	M	211,600.00			-
604a	Metal Guard Rail	M	9,000.00			-
604b	Guard Rail End Pieces	Each	70.00			-
604d	Steel Post for Guard Rail	Each	4,738.00			-
607a	Traffic Road Signs, Triangular Category -1	Each	250.00			-
607b	Traffic Road Signs, Circular, Category - 2	Each	250.00			-
607e	Traffic Road Signs Rectangular Category - 3(c)	S.M	100.00			-
608 h2	Pavement Marking in Reflective TP Paint for line of 15cm width	M	644,372.00			-
608 j2	Pavement Marking in Reflective TP Paint for 4m Arrows	Each	880.00			-
609ci	Reflectorised Plastic Pavement Studs (Raised Profile Type - Single)	Each	53,474.00			-
611a	Galvanized Wire Mesh Fence 1500mm High Incl. Prestressed & RCC Posts Complete in all respects as per M-2 Standard	M	47,080.00			-
SP-614	Delineators/Angle Reflector	Each	53,474.00			-
SP-615a	Gantry Sign Type-I as shown on drawing	Each	18.00			-
SP-615b	Gantry Sign Type-II as shown on drawing	Each	18.00			-
<b>TOTAL FOR BILL NO. 6 CARRIED TO SUMMARY</b>						-

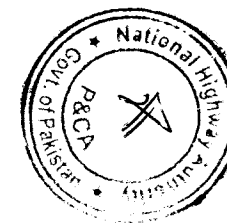




**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-3: DG Khan – Tibi Qaisrani via Shahdan Lund Section [Km 121+500 to Km 233+200 (111.70 Km)]**

**BILL NO. 7 : GENERAL ITEMS**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs.)
SP-701a	Provide Surveying & allied instruments	PS	-			5,000,000
SP-701b	Maintain Survey Instruments, Including 2no. Helpers.	Month	24			-
SP-702a	Provide the Employer's and Engineer's Representative's Office & Residence (on Rental Basis)	PS	-			10,000,000
SP-702b	Furnish and Equip. Employer's & Engineer's Representative office & Residence.	PS	-			10,000,000
SP-702c	Maintain Employer's and Engineer's Representative office and Residence.	Month	24			-
SP-703a	Provide Material Testing Project Laboratory (1 Nos On Rental Basis)	PS	-			7,500,000
SP-703b	Equip & Furnish Material Testing Project Laboratory	PS	-			12,500,000
SP-703c	Maintain Material Testing Project Laboratory 1 Nos) including 4 No Helpers.	Month	24			-
SP-708a	Provide Employer's Representative's Transport (1No)	PS	-			4,500,000
SP-708 b	Provide Engineer's Representative Transport.		-			-
	(i) 4x4 Double Cabin 2800cc with A/C	Each	2			-
	(i) Toyota Sigle Cabin with A/C	Each	1			-
	(ii) Car 1600cc With A/C	Each	-			-
	(iii) MPV 800cc with A/C	Each	-			-
SP-708c	Running & Maintenance of Employer's & Engineer's Representative's Transport	Vehicle Month	360			-
SP-715	Employing Trainee Engineer's with Boarding, Lodging and messing	Man Month	108			-
<b>TOTAL FOR BILL NO. 7 CARRIED TO SUMMARY</b>						



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-3: DG Khan – Tibi Qaisrani via Shahdan Lund Section [Km 121+500 to Km 233+200 (111.70 Km)]**

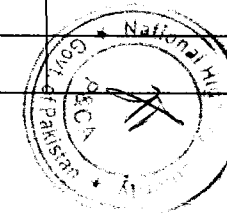
**Bill No. 8 Electrical Works (Road Lighting Network based on LED Road Lighting Fixtures) 7 No. Interchange**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs.)
	Design, supply, transportation, storage, installation, testing and commissioning of the following items of work, including all material, labour, tools and accessories etc. required for proper completion of each item as per specification, drawings and/or as directed by the Engineer.					
SP-801(a)	10 m high single bent arm conical octagonal galvanized steel pole with extension arm luminaire arrangement, base plate, J-rag bolts, 2 Amp 01 No. SP MCB, pole numbering and earthing etc. as shown on drawing.	Each	274.00			
SP-801(b)	10 m high double bent arm conical octagonal galvanized steel pole with extension arm luminaire arrangement, base plate, J-rag bolts, 2 Amp 02 Nos. SP MCB, pole numbering and earthing etc. as shown on drawing.	Each	124.00			
SP-801(c)	12 m high double bent arm conical octagonal galvanized steel pole with extension arm luminaire arrangement, base plate, J-rag bolts, 2 Amp 02 Nos. SP MCB, pole numbering and earthing etc. as shown on drawing.	Each	249.00			
SP-801(d)	Road Lighting Pole Foundation	Each	647.00			
	<b><u>Road Lights &amp; Accessories for Flood Light Installation</u></b>					
SP-802(a)	Road Lighting LED Luminaries 90W make Signify (Philips), Schreder, Tungsram (GE) or equivalent suitable for M-2 & M-3 roads of wattage suitable for the project requirements, fully IP 66 with corrosion resistant die cast aluminum housing, silicon gas kit, thermally hardened glass complete with LED drivers, surge protection and all accessories/ components required for the proper operation of the system. The luminaries shall be fully flexible for future upgrades and easy replacements for maintenance purposes. Contractor to submit lighting design calculation as per the offered light fixtures.	No.	522.00			



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**  
**Lot-3: DG Khan – Tibi Qaisrani via Shahdan Lund Section [Km 121+500 to Km 233+200 (111.70 Km)]**

SP-802(b)	Road Lighting LED Luminaries 120W make Signify (Philips), Schreder, Tungsram (GE) or equivalent suitable for M-2 & M-3 roads of wattage suitable for the project requirements, fully IP 66 with corrosion resistant die cast aluminum housing, silicon gas kit, thermally hardened glass complete with LED drivers, surge protection and all accessories/ components required for the proper operation of the system. The luminaries shall be fully flexible for future upgrades and easy replacements for maintenance purposes. Contractor to submit lighting design calculation as per the offered light fixtures.	No.	498.00			
SP-802(c)	Flood Lighting LED Luminaries 120W make Signify (Philips), Schreder, Tungsram (GE) or equivalent suitable for M-2 & M-3 roads of wattage suitable for the project requirements, fully IP 65 with corrosion resistant die cast aluminum housing, silicon gas kit, thermally hardened glass complete with LED drivers, surge protection and all accessories/ components required for the proper operation of the system. The luminaries shall be fully flexible for future upgrades and easy replacements for maintenance purposes. Contractor to submit lighting design calculation as per the offered light fixtures.	No.	36.00			
SP-802(d)	Hot dipped galvanized bracket for mounting of Flood lights alongwith all accessories.	Each	36.00			
SP-802(e)	Junction box size 12"x08"x06" (for Flood Light connection) with angle iron frame clad 16 SWG, sheet steel enclosure having high quality powder coated paint, color RAL 7032. suitable for connections with IP 54 protection class, door, locking arrangement etc. and all other accessories as required for quality work.	No.	36.00			
	- Junction box size 12"x08"x06" (for Flood Light connection)					
	- 01 No. 2 Amp. SP MCB, 10 kA					
	- 04 No. Terminal block					
	- GI flexible pipe 1" dia					
	<b>Conduits / Pipes</b>					
SP-803(a)	PVC pipe/conduit Class-D 50 mm dia with accessories suitable for laying multi-core cables in wall/structure.	Rm	360.00			
SP-803(b)	PVC pipe/conduit Class-D 100 mm dia with accessories suitable for laying multi-core cables on road crossings.	Rm	4,100.00			



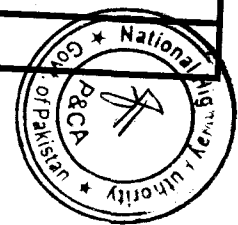
**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
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SP-803(c)	PVC pipe/conduit Class-B 100 mm dia with accessories suitable for laying multi-core cables from pole to pole and in walls/structure.	Rm	21,200.00			
	<b>Low Voltage Power Cables</b>		-			
SP-804(a)	4 Core 25mm <sup>2</sup> Cu. PVC/PVC 600/1000 Voltage grade Unarmored Cable (Tranformed to LCP) (Imported copper shall be used. Verified documentary evidence for source of copper & PVC shall be furnished prior to manufacturing)	Rm	1,300.00			
SP-804(b)	1 Core 25 mm <sup>2</sup> Cu. PVC 450/750 Voltage grade earth cable including all fixing accessories as required for earthing of lighting control panels.	Rm	180.00			
SP-804(c)	4 Core 16mm <sup>2</sup> Cu. PVC/PVC 600/1000 Voltage grade Unarmored Cable (Imported copper shall be used. Verified documentary evidence for source of copper & PVC shall be furnished prior to manufacturing)	Rm	24,000.00			
SP-804(d)	1 Core 16mm <sup>2</sup> Cu. PVC 450/750 Voltage grade Unarmored Cable (Imported copper shall be used. Verified documentary evidence for source of copper & PVC shall be furnished prior to manufacturing)	Rm	25,300.00			
SP-804(e)	3 Nos. 1 core 2.5 mm <sup>2</sup> Cu/PVC 450/750 Voltage grade cable (stranded conductor) (Imported copper shall be used. Verified documentary evidence for source of copper & PVC shall be furnished prior to manufacturing) from junction box to the fitting through the hollow of pole.		-			
i	For 10m Pole	No.	522.00			
ii	For 12m Pole	No.	498.00			
iii	For Flood Lights	No.	36.00			



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**  
**Lot-3: DG Khan – Tibi Qaisrani via Shahdan Lund Section [Km 121+500 to Km 233+200 (111.70 Km)]**

SP-805	<p>Road lighting control panel with angle iron frame clad 14 SWG, sheet steel enclosure having high quality powder coated paint, color RAL 7032. The LCP shall be complete with incoming and outgoing MCCBs, Cu bus bars, magnetic contactors, photo-electric switches, meters, indication lights, construction with IP 54 protection class, door, locking arrangement etc. and all other accessories as required for quality work.</p> <p><b>MATERIAL</b></p> <p>1 No. incoming 63 Amp.(adj.) TP, MCCB, 25 kA          4 No. outgoing 25 Amp. (adj.) TP MCCBs, 25 kA          2 No. outgoing 25 Amp. (adj.) TP MCCBs, 25 kA (Spare)          4 No. 32 Amp. magnetic contactor          2 No. 32 Amp. magnetic contactor (Spare)          3 No. photo-electric switches with timers and relays          a) 1 No. ammeters 0-100 Amp, with selector switch (04 position) and CT of 100/5 Amp          b) 3 No. indication lights          c) 1 No. voltmeter with fuse and 7 position selector switch.          d) 3 Ph, N &amp; Earth copper bus bars Internal wiring &amp; line-up terminals etc. Brass cable glands/accessories          e) 06 Nos. Auto-Manual-OFF (3 position switches for operation in auto (with photocell) and normal (manual mode-photocell override)          f) 06 Nos.ON &amp; 06 Nos. OFF push button switch's with indication lights          g) Panel Light with limit Switch</p>	Job	9.00			
SP-806	<p>Earth point comprising of 10 ft. 5/8" dia. (16 mm dia) copper coated M.S. rods driven in ground near each lighting control panel. The earthing rods shall be completed with fixing clamps etc.</p>	Each	18.00			
SP-807 As per WAPDA Specs.	<p>Pole mounted transformer 25 kVA, 11/0.415 kV and all accessories, Installation and Connection Charges with energy meter as per WAPDA standards and practice.</p>	Job	9.00			
<b>Total of Bill No 8</b>						



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
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- Note:** The cost of materials are inclusive of General Sales Tax (G.S.T)
- The cost of security deposit and obtaining of 11 kV electrical connection with installation material from WAPDA shall be finalized as per site requirement and the cost for the same is not included in the above.
- The above referred cost is for estimation purposes only and are based on budgetary quotations from the different manufacturers/suppliers. The final cost for the referred items shall be decided/finalized by the Client as per method of procurement i.e. open tendering, limited quotations from prequalified manufacturers/suppliers or any other.
- The list of manufacturers/suppliers of different equipment/materials given as below in order to establish conformance of the product in accordance with the relevant International Standards as applicable. The contractor shall provide and fix the equipment/materials of brand new & superior quality as indicated below or approved equivalent as per approval of the Engineer/Employer
- LV and Control Cables: As per approved by Client
  - PVC Conduit & Accessories: Beta, Popular, Galco
  - G.I / MS Conduit & Accessories: Hilal Industries, IIL, Jamal, Pioneer
  - MCCBs, MCB: Marlin Gerlin (MG) (France), Siemens (Germany), ABB (Italy), Legrand (France), Terasaki (Japan)
  - Magnetic Contactors: ABB (Italy), Panasonic Green power (Japan), Telemecanique
  - ACBs,, ELCBs: ABB (Italy), Siemens (Germany), MG (France) Terasaki (Japan)
  - Photoelectric EE Switches: National Photoelectric EE Switches
  - Relays and Timers: Finder (Italy), Inter (Turkey)
  - LV Changeover switch: Socomec (France), ABB (France/Germany)
  - Capacitors: Amber, Nokian
  - Voltmeter/Ammeters: Circulor (Italy), Revalco (Italy), Inter (Turkey), Entes (Turkey)
  - Current Transformer/Voltage
  - Transformer: Circulor (Italy), Revalco (Italy), Fico
  - Selector Switches/ Push button/switches/switch socket: Kraus & Naimer, ABB, Legrand, Clipsal Revalco (Italy)
  - Indication Lamps: Legrand (France), Breter (Italy) ABB, Telemecanique
  - Terminal Blocks: Legend (France), ABB, Phoenix, Cabour: Legrand (France), Breter (Italy) ABB, Telemecanique
  - Cable Trays / Ladders: Bilal Industries Pvt. Ltd, Shaheen Corporation Pvt Ltd, AKS Engineering Pvt Ltd
  - Wiring Accessories: Legrang & Clipsal
  - ATS/AMF Module and Battery Charger: DeepSea, Datakom
  - Road Light Poles Jamal Pipe Industries, Bashir Pipe Industries
  - Lighting Signify (Philips), Schreder, Tungsram (GE)



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**  
**Lot-3: DG Khan – Tibi Qaisrani via Shahdan Lund Section [Km 121+500 to Km 233+200 (111.70 Km)]**

ATS/AMF Module and Battery Charger: DeepSea, Datakom  
- Road Light Poles Jamal Pipe Industries, Bashir Pipe Industries  
Lighting Signify (Philips), Schreder, Tungfram (GE)



**ISLAMIC REPUBLIC OF PAKISTAN  
NATIONAL HIGHWAY AUTHORITY**



**OCB/CAREC/T-III:**

**Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 KM) from Two-Lane to Four-Lane Under one Package Comprising of Four Lots**

- *Lot-4: Tibi Qaisrani to DI Khan via Ramak Section (96.245Km)*

**BILL OF QUANTITIES**





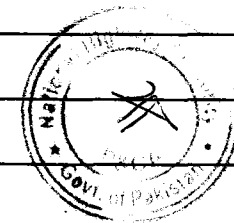
**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots**

**Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

**BILL OF QUNATITIES**

**SUMMARY**

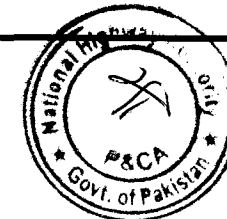
<b>S/NO</b>	<b>DESCRIPTION</b>	<b>TOTAL AMOUNT IN FIGURES (PKR)</b>
1	EARTHWORK AND ALLIED ACTIVITIES	
2	SUB BASE & BASE	
3	SURFACE COURSES AND PAVEMENT	
4.1	STRUCTURES (BRIDGES)	
4.2	STRUCTURES (BOX CULVERTS)	
4.3	STRUCTURES (CATTLE CREEP)	
4.4	STRUCTURES (SUBWAYS)	
4.5	STRUCTURES (PIPE CULVERTS)	
4.6	STRUCTURES (SOIL INVESTIGATION FOR BRIDGES)	
5	DRAINAGE & EROSION WORKS	
6	ANCILLARY WORKS	
7	GENERAL ITEMS	
8	ELECTRICAL ITEMS	
	<b>TOTAL CONSTRUCTION COSTS</b>	



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

**BILL NO. 1 : EARTH WORK**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
101	Clearing and Grubbing	S.M	1,842,400.00			-
102a	Removal of Trees 150-300 mm Girth	Each	90.00			-
102b	Removal of Trees 301-600 mm Girth	Each	90.00			-
102c	Removal of Trees 601mm or over Girth	Each	50.00			-
104	Compaction of Natural Ground	S.M	1,842,400.00			-
106a	Excavate Unsuitable Common Material	C.M	70,030.79			-
108a	Formation of Embankment from Roadway Excavation in Common Material	C.M	754,610.39			-
108c	Formation of Embankment from Borrow Excavation in Common Material	C.M	1,690,318.00			-
108d	Formation of Embankment from Structural Excavation in Common Material	C.M	245,281.00			-
109a	Subgrade Preparation in Earth Cut	S.M	790,829.00			-
110	Improved Subgrade (having 25% CBR)	C.M	789,593.00			-
SP-117a	Formation of granular material platform	C.M	60,000.00			-
SP-117b	Formation of Earthen Dowels	C.M	34,320.00			-
	<b>TOTAL FOR BILL NO.1 CARRIED TO SUMMARY</b>					-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

**BILL NO. 2 : SUBBASE & BASE**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
201	Granular Subbase	C.M	545,797.00			-
201a	Re-use of salvaged Granular Material from existing road as subbase	C.M	283,257.52			-
202	Aggregate Base Course	C.M	549,012.00			-
203b	Asphaltic Base Course Plant mix (Class B)	C.M	275,995.00			-
209a	Breaking of Existing Road Pavement Structure	C.M	556,450.00			-
209b	Scarification of Existing Road Pavement	S.M	2,500.00			-
<b>TOTAL FOR BILL NO.2 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

**BILL NO. 3 : SURFACE COURSES & PAVEMENT**

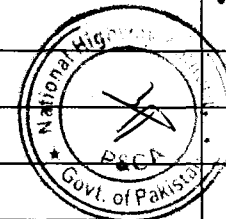
Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
302a	Cut -Back Asphalt for Bituminous Prime Coat	S.M	2,034,588			-
303a	Cut -Back Asphalt for Bituminous Tack Coat	S.M	3,848,821			-
304c	Triple Surface Treatment	S.M	772,800			-
305a	Asphaltic Concrete for Wearing Course (Class "A")	C.M	98,091			-
<b>TOTAL FOR BILL NO.3 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

**BILL NO. 4.1 : STRUCTURE (BRIDGES)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
107 a	Structural Excavation in Common Material	C.M	47,750.70			-
107 d	Granular Backfill	C.M	6,831.00			-
107 e	Common Backfill	C.M	29,756.00			-
401 f	Lean Concrete	C.M	537.44			-
401 a3i	Concrete Class A3 (Underground)	C.M	19,963.46			-
401 a3ii	Concrete Class A3 (On ground)	C.M	14,158.30			-
401 a3iii	Concrete Class A3 (Elevated)	C.M	15,996.07			-
401 d	Concrete Class D1 (5000 psi)	C.M	9,172.81			-
404 b	Reinforcement as Per AASHTO M.31 Grade 60	TON	9,308.63			-
407 d1	Cast in place piles upto 1.0 m normal soil (Boring Only)	M	11,643.00			-
407 d2	Cast in place piles upto 1.0 m gravel strata (Boring Only)	M	2,911.00			-
407 d3	Cast in place piles upto 1.1 to 1.5 m normal soil (Boaring Only)	M	12,208.00			-
407 d4	Cast in place piles upto 1.1 to 1.5 m gravel strata (Boaring Only)	M	3,199.00			-
405 a	Prestressing wire strand, 3/8" - 1/2" dia, complete in all respect	TON	192.95			-
405 b	Launching of Girders	TON	22,014.74			-
407 l	Pile load test upto 800 ton (2.5 time the design load)	Each	23.00			-
407 k	Pile proof test upto 550 ton (1.5 time the design load)	Each	23.00			-
407 n	Permanent Pile Casing for Pile (10mm thick)	Ton	252.00			-
SP-415	Sonic Integrity Tests (SIT)	Each	1,525.00			-
SP-416	Manufactured Trade Marks expansion joints to roadway (25-30) mm movement	M	1,453.00			-



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Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

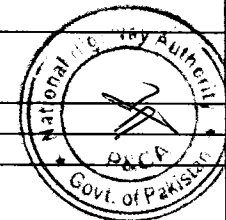
**BILL NO. 4.1 : STRUCTURE (BRIDGES)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
406 ei	Elastomeric Bearing Pads (according to size and thickness) below girders - USA/EU make	C.cm	580,545.00			-
406 a	Premoulded Joint Filler 12 Mm Thick With Bitumastic Joint Seal	S.M	2,660.80			-
507 a	Steel Wire Mesh for Gabion	Kg	57,508.05			-
507 b	Rockfill in Gabion	Cu.M	7,854.50			-
SP-418	100 mm dia GI drain pipe	M	1,659.00			-
509 d	Grouted Rip Rap (Class A)	Cu. M	1,701.00			-
509 e	Grouted Rip Rap (Class B)	Cu.M	3,722.35			-
SP-417	Bitumen Coatings to Cement or Concrete surface using 0.60 kg/sq.m.	S.M	1,229.88			-
604a	Metal Guard Rail (Either Side of Bridge)	M	6,213.38			-
<b>TOTAL FOR BILL NO.4.1 CARRIED TO SUMMARY</b>						-

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Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

**BILL NO. 4.2 : STRUCTURE (BOX CULVERTS)**

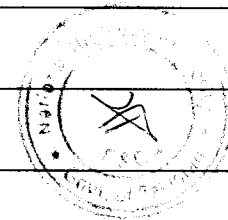
Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
107 a	Structural Excavation in Common Material	C.M	334,073.25			-
107 d	Granular Backfill	C.M	182,795.55			-
107 e	Common Backfill	C.M	116,061.00			-
401 f	Lean Concrete	C.M	7,230.78			-
401 a3i	Concrete Class A3 (Underground)	C.M	6,760.57			-
401 a3ii	Concrete Class A3 (4000 psi) On Ground	C.M	56,764.56			-
401 a3iii	Concrete Class A3 (4000 psi) Elevated	C.M	28,300.65			-
404 b	Reinforcement as Per AASHTO M.31Grade 60	TON	14,416.65			-
406 d ii	PVC Water Stop 8 " Size	M	2,929.60			-
507a	Steel Wire Mesh for Gabion	Kg.	6,906.90			-
507b	Rock Fill in Gabion	CM	1,116.15			-
509 d	Grouted Rip Rap (Class A)	C.M	5,481.00			-
SP-417	Bitumen Coatings to Cement or Concrete surface using 0.60 kg/sq.m.	S.M	50,631.00			-
<b>TOTAL FOR BILL NO.4.2 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

**BILL NO. 4.3 : STRUCTURE (CATTLE CREEP)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
107 a	Structural Excavation in Common Material	C.M	1,318.00			-
107 d	Granular Backfill	C.M	439.00			-
107 e	Common Backfill	C.M	132.00			-
401 f	Lean Concrete	C.M	50.00			-
401 a3i	Concrete Class A3 (Underground)	C.M	33.00			-
401 a3ii	Concrete Class A3 (On ground)	C.M	325.00			-
401 a3iii	Concrete Class A3 (Elevated)	C.M	318.00			-
404 b	Reinforcement as Per AASHTO M.31 Grade 60	TON	84.00			-
509 d	Grouted Rip Rap (Class A)	C.M	79.00			-
SP-417	Bitumen Coatings to Cement or Concrete surface using 0.60 kg/sq.m.	S.M	206.00			-
<b>TOTAL FOR BILL NO.4.3 CARRIED TO SUMMARY</b>						-

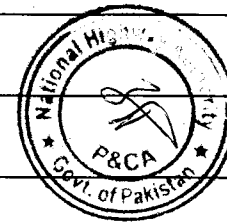




**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

**BILL NO. 4.4 : STRUCTURE (SUBWAYS)**

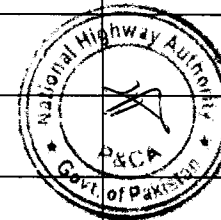
Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
107 a	Structural Excavation in Common Material	C.M	5,716.00			-
107 d	Granular Backfill	C.M	1,715.00			-
107 e	Common Backfill	C.M	401.00			-
401 f	Lean Concrete	C.M	435.00			-
401 a3i	Concrete Class A3 (Underground)	C.M	141.00			-
401 a3ii	Concrete Class A3 (On ground)	C.M	1,560.00			-
401 a3iii	Concrete Class A3 (Elevated)	C.M	1,250.00			-
404 b	Reinforcement as Per AASHTO M.31 Grade 60	TON	366.00			-
509 d	Grouted Rip Rap (Class A)	C.M	230.00			-
SP-419	Steel Grating / Gully Grating Chamber (450 mm x 450 mm)	Sq-m	99.00			-
<b>TOTAL FOR BILL NO. 4.4 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

**BILL NO. 4.5 : STRUCTURE (PIPE CULVERTS)**

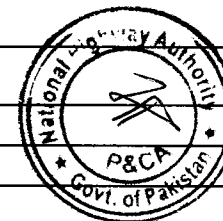
Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
107 a	Structural Excavation in Common Material	C.M	615.00			-
107 d	Granular Backfill	C.M	381.00			-
107 e	Common Backfill	C.M	310.00			-
401 f	Lean Concrete	C.M	91.00			-
401 a3i	Concrete Class A3 (Underground)	C.M	21.00			-
401 a3ii	Concrete Class A3 (On ground)	C.M	191.00			-
401 a3iii	Concrete Class A3 (Elevated)	C.M	84.00			-
404 b	Reinforcement as Per AASHTO M.31Grade 60	TON	4.00			-
501 o	R.C.C. pipe culvert AASHTO M 170 class IV dia 910 mm	M	146.00			-
509 d	Grouted Rip Rap (Class A)	C.M	1,747.00			-
<b>TOTAL FOR BILL NO.4.5 CARRIED TO SUMMARY</b>						-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

**BILL NO 4.6 : STRUCTURES (SOIL INVESTIGATION FOR BRIDGES)**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
SP-414 (a)	6" minimum dia drilling straight rotary/ Percussion including back filling of holes from NSL upto 45m depth or till the rock level, which ever is met earlier.	LM	5,490.00			-
SP-414(b)	Perform SPT at 1 m interval i/c collection, preservation & Transportation of disturbed samples to an approved Laboratory.	No.	2,440.00			-
SP-414(b-1)	Continuous core drilling in bedrock up to a maximum of 5 m depth below rock strike level, including determination of core recovery/ RQD, preservation of core samples in core boxes, labelling, waxing of selected core samples, photography of rock cores and transportation of core samples to the laboratory. In case core recovery is less than 80% reduce run length to 0.5 m.	LM	610.00			-
SP-414(c)	Collection of undisturbed soil samples from boreholes using Shelby pitcher/denison sampler i/c preservation and transportation of samples to an approved Laboratory.	No.	366.00			-
SP-414(d)	Performance of FDT in test pits through sand replacement method i/c moisture content determination.	No.	366.00			-
SP-414(e)	Excavation of testpits upto 1.5 m depth along road alignment including backfilling of pits to original condition.	M	366.00			-
SP-414(f)	Collection of undisturbed block samples from test pits at appropriate location as directed by the Engineer.	No.	366.00			-
SP-414(f1)	Collection of composite bulk sample (atleast 60 kg for sandy/clayey soils and 120 kg for gravelly soils)	No.	122.00			-
SP-414(g)	Collection & preservation of water samples from bore holes & transportation to an approved Laboratory.	No.	244.00			-
SP-414(h)	Laboratory Testing		-			-
i.	Grain size analysis.	No.	748.80			-
ii.	Hydrometer analysis.	No.	299.00			-
iii.	Atterberg limits	No.	299.00			-
iv.	Specific gravity	No.	111.80			-
v.	Natural moisture content	No.	335.40			-
vi.	Bulk density & Dry density (Soil/rock cores)	No.	335.40			-
vii.	Direct shear test	No.	150.80			-
viii.	Consolidation test (collapse/swell potential)	No.	75.40			-



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
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ix.	Unconfined compression test (Soil/rock cores)	No.	260.00			-
x.	Chemical analysis of soil	No.	39.00			-
xi.	Chemical analysis of water	No.	75.40			-
xii.	Submission of Investigation Report (triplicate)	No.	39.00			-
xiii.	CBR	No.	75.40			-
xvi.	Modified Proctor Test	No.	75.40			-
<b>TOTAL FOR BILL NO.4.6 CARRIED TO SUMMARY</b>						-

Note: 1. Preferred method of drilling is straight rotary method. Percussion method will be allowed only if gravelly strata is encountered.  
2. All soil/rock samples must be labeled, stored and transported as per ASTM. The area ratio and clearance ratio of the thin walled should be in strict compliance with relevant ASTM standard.



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

**BILL NO. 5 : DRAINAGE AND EROSION WORKS**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
107 a	Structural Excavation in Common Material	C.M	35,482.00			-
107d	Granular Backfill	C.M	5,914.00			-
401a1ii	Concrete Class A1, (on Ground)	C.M	21,843.00			-
401a1iii	Concrete Class A1, (Elevated)	C.M	10,983.00			-
401 f	Lean Concrete	C.M	2,007.00			-
404 b	Reinforcement as per AASHTO M-31 Grade 60	TON	2,109.00			-
406 a	Premoulded Joint Filler 12mm thick with Bitumastic Joint Seal	S.M	67.00			-
406dii	PVC Waterstop 8" Size	L.M	5,492.00			-
501f	RCC Pipe Culvert AASHTO M 170 Class II dia 910mm	M	2,750.00			-
502b	Concrete Class B in bedding and Encasement of Concrete Pipe Culvert	C.M	2,238.00			-
509a	Rip Rap, Class "A"	CM	1,630.00			-
509d	Grouted Rip Rap, Class "A"	C.M	14,152.00			-

**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

510	Dismantling of Structure and Obstruction	C.M	15,400.00			
511a1	Dry Stone Pitching (15-20cm thick) with Bitumen Joints	S.M	22,080.00			
511b1	Grouted Stone Pitching (15-20cm thick) with Bitumen Joints	S.M	50,240.00			
<b>TOTAL FOR BILL NO.5 CARRIED TO SUMMARY</b>						



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

**BILL NO. 6 : ANCILLARY WORKS**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
601ai	RCC New Jersey Barrier (In-Situ) for Median Double Face (Incl. Reinforcement)	M	98,990.00			-
601aii	RCC New Jersey Barrier (In-Situ) Single Face (Incl. Reinforcement)	M	11,920.00			-
601dii	Precast Curb in Concrete Class A-1 of Size 450 x 150 mm Incl. Bedding & Haunching	M	201,180.00			-
604a	Metal Guard Rail	M	2,000.00			-
604b	Guard Rail End Pieces	Each	120.00			-
604d	Steel Post for Guard Rail	Each	1,053.00			-
607a	Traffic Road Signs, Triangular Category -1	Each	250.00			-
607b	Traffic Road Signs, Circular, Category - 2	Each	250.00			-
607e	Traffic Road Signs Rectangular Category - 3(c)	S.M	100.00			-
608 h2	Pavement Marking in Reflective TP Paint for line of 15cm width	M	497,315.00			-
608 j2	Pavement Marking in Reflective TP Paint for 4m Arrows	Each	385.00			-
609ci	Reflectorised Plastic Pavement Studs (Raised Profile Type - Single)	Each	43,158.00			-
611a	Galvanized Wire Mesh Fence 1500mm High Incl. Prestressed & RCC Posts Complete in all respects as per M-2 Standard	M	14,080.00			-

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Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

SP-614	Delineators/Angle Reflector	Each	43,158.00			
SP-615a	Gantry Sign Type-I as shown on drawing	Each	6.00			
SP-615b	Gantry Sign Type-II as shown on drawing	Each	6.00			
<b>TOTAL FOR BILL NO. 6 CARRIED TO SUMMARY</b>						

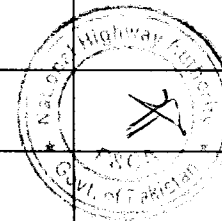




**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
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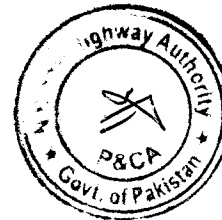
**BILL NO. 7 : GENERAL ITEMS**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
SP-701a	Provide Surveying & allied instruments	PS	-	-	-	5,000,000
SP-701b	Maintain Survey Instruments, Including 2no. Helpers.	Month	24	-	-	-
SP-702a	Provide the Employer's and Engineer's Representative's Office & Residence (on Rental Basis)	PS	-	-	-	10,000,000
SP-702b	Furnish and Equip. Employer's & Engineer's Representative office & Residence.	PS	-	-	-	10,000,000
SP-702c	Maintain Employer's and Engineer's Representative office and Residence.	Month	24	-	-	-
SP-703a	Provide Material Testing Project Laboratory (1 Nos On Rental Basis)	PS	-	-	-	7,500,000
SP-703b	Equip & Furnish Material Testing Project Laboratory	PS	-	-	-	12,500,000
SP-703c	Maintain Material Testing Project Laboratory 1 Nos) including 4 No Helpers.	Month	24	-	-	-
SP-708a	Provide Employer's Representative's Transport (1No)	PS	-	-	-	4,500,000
SP-708 b	Provide Engineer's Representative Transport.					
	(i) 4x4 Double Cabin 2800cc with A/C	Each	1			
	(ii) Car 1600cc With A/C	Each	-			



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
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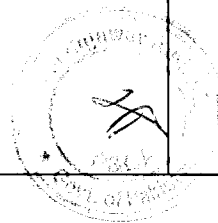
	(iii) Pickup Single Cabin With A/C	Each	2			
SP-708c	Running & Maintenance of Employer's & Engineer's Representative's Transport	Vehicle Month	360			
SP-715	Employing Trainee Engineer's with Boarding, Lodging and messing	Man Month	108			
<b>TOTAL FOR BILL NO. 7 CARRIED TO SUMMARY</b>						



**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

**Bill No. 8 Electrical Works (Road Lighting Network based on LED Road Lighting Fixtures) 2 No. Interchange**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
	Design, supply, transportation, storage, installation, testing and commissioning of the following items of work, including all material, labour, tools and accessories etc. required for proper completion of each item as per specification, drawings and/or as directed by the Engineer.					
SP-801(a)	10 m high single bent arm conical octagonal galvanized steel pole with extension arm luminaire arrangement, base plate, J-rag bolts, 2 Amp 01 No. SP MCB, pole numbering and earthing etc. as shown on drawing.	Each	40.00			
SP-801(b)	10 m high double bent arm conical octagonal galvanized steel pole with extension arm luminaire arrangement, base plate, J-rag bolts, 2 Amp 02 Nos. SP MCB, pole numbering and earthing etc. as shown on drawing.	Each	33.00			
SP-801(c)	12 m high double bent arm conical octagonal galvanized steel pole with extension arm luminaire arrangement, base plate, J-rag bolts, 2 Amp 02 Nos. SP MCB, pole numbering and earthing etc. as shown on drawing.	Each	56.00			
SP-801(d)	Road Lighting Pole Foundation	Each	129.00			
	<b>Road Lights &amp; Accessories for Flood Light Installation</b>					
SP-802(a)	Road Lighting LED Luminaries 90W make Signify (Philips), Schreder, Tungsram (GE) or equivalent suitable for M-2 & M-3 roads of wattage suitable for the project requirements, fully IP 66 with corrosion resistant die cast aluminum housing, silicon gas kit, thermally hardened glass complete with LED drivers, surge protection and all accessories/ components required for the proper operation of the system. The luminaries shall be fully flexible for future upgrades and easy replacements for maintenance purposes. Contractor to submit lighting design calculation as per the offered light fixtures.	No.	106.00			



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SP-802(b)	Road Lighting LED Luminaries 120W make Signify (Philips), Schreder, Tungsram (GE) or equivalent suitable for M-2 & M-3 roads of wattage suitable for the project requirements, fully IP 66 with corrosion resistant die cast aluminum housing, silicon gas kit, thermally hardened glass complete with LED drivers, surge protection and all accessories/ components required for the proper operation of the system. The luminaries shall be fully flexible for future upgrades and easy replacements for maintenance purposes. Contractor to submit lighting design calculation as per the offered light fixtures.	No.	112.00			
SP-802(c)	Flood Lighting LED Luminaries 120W make Signify (Philips), Schreder, Tungsram (GE) or equivalent suitable for M-2 & M-3 roads of wattage suitable for the project requirements, fully IP 65 with corrosion resistant die cast aluminum housing, silicon gas kit, thermally hardened glass complete with LED drivers, surge protection and all accessories/ components required for the proper operation of the system. The luminaries shall be fully flexible for future upgrades and easy replacements for maintenance purposes. Contractor to submit lighting design calculation as per the offered light fixtures.	No.	8.00			

**Bill No. 8 Electrical Works (Road Lighting Network based on LED Road Lighting Fixtures) 2 No. Interchange**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
SP-802(d)	Hot dipped galvanized bracket for mounting of Flood lights alongwith all accessories.	Each	8.00			-
SP-802(e)	Junction box size 12"x08"x06" (for Flood Light connection) with angle iron frame claded 16 SWG, sheet steel enclosure having high quality powder coated paint, color RAL 7032. suitable for connections with IP 54 protection class, door, locking arrangement etc. and all other accessories as required for quality work.	No.	8.00			-
	- Junction box size 12"x08"x06" (for Flood Light connection)					-
	- 01 No. 2 Amp. SP MCB, 10 kA					-
	- 04 No. Terminal block					-
	- GI flexible pipe 1" dia					-
	<b>Conduits / Pipes</b>					-
SP-803(a)	PVC pipe/conduit Class-D 50 mm dia with accessories suitable for laying multi-core cables in wall/structure.	Rm	80.00			-



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**Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

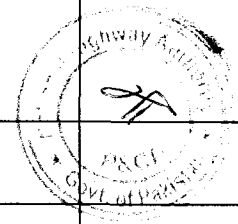
SP-803(b)	PVC pipe/conduit Class-D 100 mm dia with accessories suitable for laying multi-core cables on road crossings.	Rm	900.00			
SP-803(c)	PVC pipe/conduit Class-B 100 mm dia with accessories suitable for laying multi-core cables from pole to pole and in walls/structure.	Rm	4,700.00			
	<b>Low Voltage Power Cables</b>					
SP-804(a)	4 Core 25mm <sup>2</sup> Cu. PVC/PVC 600/1000 Voltage grade Unarmored Cable (Tranformer to LCP) (Imported copper shall be used. Verified documentary evidence for source of copper & PVC shall be furnished prior to manufacturing)	Rm	300.00			
SP-804(b)	1 Core 25 mm <sup>2</sup> Cu. PVC 450/750 Voltage grade earth cable including all fixing accessories as required for earthing of lighting control panels.	Rm	40.00			
SP-804(c)	4 Core 16mm <sup>2</sup> Cu. PVC/PVC 600/1000 Voltage grade Unarmored Cable (Imported copper shall be used. Verified documentary evidence for source of copper & PVC shall be furnished prior to manufacturing)	Rm	5,000.00			
SP-804(d)	1 Core 16mm <sup>2</sup> Cu. PVC 450/750 Voltage grade Unarmored Cable (Imported copper shall be used. Verified documentary evidence for source of copper & PVC shall be furnished prior to manufacturing)	Rm	5,300.00			
SP-804(e)	3 Nos. 1 core 2.5 mm <sup>2</sup> Cu/PVC 450/750 Voltage grade cable (stranded conductor) (Imported copper shall be used. Verified documentary evidence for source of copper & PVC shall be furnished prior to manufacturing) from junction box to the fitting through the hollow of pole.					
i	For 10m Pole	No.	106.00			
ii	For 12m Pole	No.	112.00			
iii	For Flood Lights	No.	8.00			



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Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

**Bill No. 8 Electrical Works (Road Lighting Network based on LED Road Lighting Fixtures) 2 No. Interchange**

Item No.	Description	Unit	Quantity	Rate in Figures	Rate in Words	Amount (Rs)
SP-805	Road lighting control panel with angle iron frame clad 14 SWG, sheet steel enclosure having high quality powder coated paint, color RAL 7032. The LCP shall be complete with incoming and outgoing MCCBs, Cu bus bars, magnetic contactors, photo-electric switches, meters, indication lights, construction with IP 54 protection class, door, locking arrangement etc. and all other accessories as required for quality work. MATERIAL 1 No. incoming 63 Amp.(adj.) TP, MCCB, 25 kA 4 No. outgoing 25 Amp. (adj.) TP MCCBs, 25 kA 2 No. outgoing 25 Amp. (adj.) TP MCCBs, 25 kA (Spare) 4 No. 32 Amp. magnetic contactor 2 No. 32 Amp. magnetic contactor (Spare) 3 No. photo-electric switches with timers and relays a) 1 No. ammeters 0-100 Amp, with selector switch (04 position) and CT of 100/5 Amp b) 3 No. indication lights c) 1 No. voltmeter with fuse and 7 position selector switch. d) 3 Ph, N & Earth copper bus bars Internal wiring & line-up terminals etc. Brass cable glands/accessories e) 06 Nos. Auto-Manual-OFF (3 position switches for operation in auto (with photocell) and normal (manual mode-photocell override) f) 06 Nos.ON & 06 Nos. OFF push button switch's with indication lights g) Panel Light with limit Switch	Job	2.00			
SP-806	Earth point comprising of 10 ft. 5/8" dia. (16 mm dia) copper coated M.S. rods driven in ground near each lighting control panel. The earthing rods shall be completed with fixing clamps	Each	4.00			
SP-807 As per WAPDA Specs.	Pole mounted transformer 25 kVA, 11/0.415 kV and all accessories, Installation and Connection Charges with energy meter as per WAPDA standards and practice.	Job	2.00			



OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]

	Total of Bill No 8				
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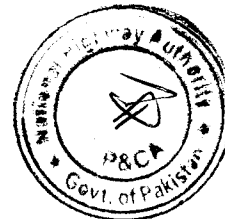
**OCB/CAREC/T-III: Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane under One Package Comprising of Four Lots  
Lot-4: Tibi Qaisrani – DI Khan via Ramak Section [Km 233+200 to Km 329+445 (96.245 Km)]**

**Note:**

The cost of materials are inclusive of General Sales Tax (G.S.T) the cost of security deposit and obtaining of 11 KV electrical connection with installation material from WAPDA shall be finalized as per site requirement and the cost for the same is not included in the above. The above referred cost is for estimation purposes only and are based on budgetary quotations from the different manufacturers/suppliers. The final cost for the referred items shall be decided/finalized by the Client as per method of procurement i.e. open tendering, limited quotations from prequalified manufacturers/suppliers or any other.

The list of manufacturers/suppliers of different equipment/materials given as below in order to establish conformance of the product in accordance with the relevant International Standards as applicable. The contractor shall provide and fix the equipment/materials of brand new & superior quality as indicated below or approved equivalent as per approval of the Engineer/Employer

- LV and Control Cables: As per approved by Client
- PVC Conduit & Accessories: Beta, Popular, Galco
- G.I / MS Conduit & Accessories: Hilal Industries, IIL, Jamal, Pioneer
- MCCBs, MCB: Marlin Gerlin (MG) (France), Siemens (Germany), ABB (Italy), Legrand (France), Terasaki (Japan)
- Magnetic Contactors: ABB (Italy), Panasonic Green power (Japan), Telemecanique
- ACBs, ELCBs: ABB (Italy), Siemens (Germany), MG (France) Terasaki (Japan)
- Photoelectric EE Switches: National Photoelectric EE Switches
- Relays and Timers: Finder (Italy), Inter (Turkey)
- LV Changeover switch: Socomec (France), ABB (France/Germany)
- Capacitors: Amber, Nokian
- Voltmeter/Ammeters: Circolor (Italy), Revalco (Italy), Inter (Turkey), Entes (Turkey)
- Current Transformer/Voltage
- Transformer: Circolor (Italy), Revalco (Italy), Fico
- Selector Switches/ Push button/switches/switch socket: Kraus & Naimer, ABB, Legrand, Clipsal Revalco (Italy)
- Indication Lamps: Legrand (France), Breter (Italy) ABB, Telemecanique
- Terminal Blocks: Legend (France), ABB, Phoenix, Cabour: Legrand (France), Breter (Italy) ABB, Telemecanique
- Cable Trays / Ladders: Bilal Industries Pvt. Ltd, Shaheen Corporation Pvt Ltd, AKS Engineering Pvt Ltd
- Wiring Accessories: Legrang & Clipsal
- ATS/AMF Module and Battery Charger: DeepSea, Datakom
- Road Light Poles Jamal Pipe Industries, Bashir Pipe Industries
- Lighting Signify (Philips), Schreder, Tungsram (GE)





## Section 5: Eligible Countries

This section contains the list of eligible countries.

1. Afghanistan
2. Armenia
3. Australia
4. Austria
5. Azerbaijan
6. Bangladesh
7. Belgium
8. Bhutan
9. Brunei Darussalam
10. Cambodia
11. Canada
12. China, People's Republic of
13. Cook Islands
14. Denmark
15. Fiji Islands, Republic of
16. Finland
17. France
18. Georgia
19. Germany
20. Hong Kong, China
21. India
22. Indonesia
23. Ireland
24. Italy
25. Japan
26. Kazakhstan
27. Kiribati
28. Korea, Republic of
29. Kyrgyz, Republic of
30. Lao People's Democratic Republic
31. Luxembourg
32. Malaysia
33. Maldives
34. Marshall Islands
35. Micronesia, Federal States of
36. Mongolia
37. Myanmar
38. Nauru, Republic of
39. Nepal
40. Netherlands
41. New Zealand
42. Norway
43. Pakistan
44. Palau, Republic of
45. Papua New Guinea
46. Philippines
47. Portugal
48. Samoa
49. Singapore
50. Solomon Islands
51. Spain
52. Sri Lanka
53. Sweden
54. Switzerland
55. Tajikistan
56. Taipei, China
57. Thailand
58. Timor-Leste, Democratic Republic of
59. Tonga
60. Turkey
61. Turkmenistan
62. Tuvalu
63. United Kingdom
64. United States of America
65. Uzbekistan
66. Vanuatu
67. Viet Nam
68. Niue

**Note: The list of current member countries is also available at <http://www.adb.org/about/members>**



# Section 6: Works' Requirements

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# Specifications

- (a) General Specifications (NHA's General Specifications 1998) attached as Bidding Document, Volume-II: Specifications
- (b) The Addenda/Corrigenda to NHA's General Specifications Attached in Above Volume-II
- (c) Special Provisions (Specifications) (SP-Items) Attached within Bidding Document as Special Provisions (SP) under this Section 6 (as follows)



**ISLAMIC REPUBLIC OF PAKISTAN  
NATIONAL HIGHWAY AUTHORITY**



**OCB/CAREC/T-III:**

**Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 KM) from Two-Lane to Four-Lane Under one Package Comprising of Four Lots**

➤ *Lot-1: Rajanpur – Jampur Section (57.50 Km)*

**PARTICULAR SPECIFICATION/  
SPECIAL PROVISIONS**



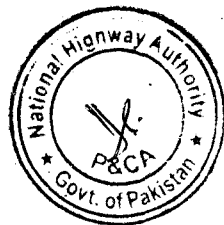
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- Item 108 Formation of Embankment
- Item 109 Subgrade Preparation
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- Item 202 Aggregate Base Course
- Item 203 Asphaltic Base Course (hot plant mix)
- Item 305 Asphalt Wearing Course – hot plant mix
- Item 401 Concrete

## 2. Special provision

- SP -117a Formation of granular material platform
- SP -117b Formation of Earthen dowels
- SP- 414 Soil Investigations at Bridge Sites
- SP- 415 Sonic Integrity Tests (SIT) on all Piles
- SP- 416 Manufactured Trade Marks expansion joints
- SP- 417 Bitumen Coating
- SP- 418 Galvanized Iron Drain Pipe
- SP- 419 Steel Grating / Gully Grating Chamber
- SP- 614 Delineators / Angle Reflectors
- SP- 615 Gantry Signs
- SP - 701 Provisions of survey teams and instruments
- SP - 702 Provide equip & furnish engineer's office & accommodation
- SP- 703 Provide, equip and maintain laboratory for the project
- SP - 708 Provide, running and maintain transport for employer / Engineer's representative
- SP - 715 Employing Trainee Engineer's with Boarding, Lodging & Messing
- SP - 800 Electrical Works
- SP - 801 Poles for Road Lighting
- SP - 802 Luminaries
- SP - 803 Conduits & Pipes
- SP - 804 LV Cables
- SP - 805 Lighting Control Panel
- SP - 806 Earthing



# Particular Specifications



## **ITEM 107 STRUCTURAL EXCAVATION AND BACKFILL**

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### **107.1 DESCRIPTION**

In line 12, add at the end:

This includes excavation below original ground and back filling with granular or select fill. All common backfilling above the level of the original ground shall be payable under Item 108.

Delete 107.2.1, 107.2.2 and replace with the following.

### **107.2.1 Backfill around Structure**

Backfill around or below structure shall be made with the following material.

- a) Granular backfill / Select Fill material as specified hereunder
- b) Common backfill shall be carried out from excavated material or any other borrow material approved by the Engineer.

### **107.2.2 Granular backfill/Select Fill**

Granular backfill/Select fill material shall meet the following requirements:

#### **a) Grading Requirement**

<b>mm.</b>	<b>inch</b>	<b>% passing</b>
25	1"	100
19	¾"	60-100
4.75	No. 4	50-80
2.0	No. 10	40-70
0.425	No. 40	25-45
0.075	No. 200	0-15

Material satisfying the requirements of coarse sand falling under soil classification A-3 (AASHTO). In case, coarse sand is utilized for granular fill it shall be ensured that the same is confined properly with approved material.

- b) The material shall have a Plasticity Index of not more than six (6) as determined by AASHTO T-89 and T-90



**107.2.3 Common Backfill**

In line 3, add after "Engineer" "as per the material requirements in Section 108.2".

Add Subsection 107.2.5

**107.2.5 Requirement of Select Fill Material Below Structures' Foundations**

Requirement of Select Fill material below structures' foundations shall be as per 107.2 or as directed in writing by the Engineer.

**107.3 CONSTRUCTION REQUIREMENTS**

**107.3.1 Structural Excavation**

a) General

Delete para 3, and add the following:

"The Contractor shall notify to the Engineer well in advance about the start of any structural excavation which constitute a pay item in the Bill of Quantities. The Engineer shall observe the cross-sectional elevations and measurements taken for the existing ground in the area of the structure. Any material removed or excavated before these measurements and approved by the Engineer will not be paid.

The Contractor shall minimize, to the extent possible, the length of time that excavated areas are open. He shall be solely responsible for damages due to weather, equipment, accidents, or other causes when excavation is left open. In this regard the Contractor shall take all required precautionary measures such as barriers, barricades and warning signs etc.

d) Preparation of Foundations of Footings

In para (ii), line 2, delete "special, care" and replace with, "special care".

At the end, add para (iii) and (iv) as follows:

iii) Foundation material on which structure is to be placed shall be compacted as per clause 107.3.3 unless otherwise directed by the Engineer.

In case unsuitable material (as per clause 108.2e) is encountered at foundation level shall be removed to the depth and extent as directed and replaced with suitable material of the type as determined by the Engineer





iv) (a) Placement of Select Fill

All vegetation, topsoil and other unsuitable materials shall be removed. Prior to placement of the first layer of select fill, the ground surface shall be compacted as given in Section 104.2.

(b) Compaction of Select Fill

The select fill material shall be placed in layers of thickness appropriate to the type of compaction equipment and compacted to meet the following minimum requirements of compaction at OMC (-2%) to + 1 % of OMC):

- 95 % M.D.D as per AASHTO T 180 or
- 74 % Relative Density as per ASTM-D 4253/4254.

f) Pumping

Add the following in the beginning

Care shall be taken during excavation to prevent disturbance to the foundation. If ground water is encountered during excavation and a concrete seal course is not to be used, dewatering shall be commenced and shall proceed in advance of or concurrently with further excavation. The foundation shall be free of water at the time, footing concrete is placed and water control shall continue as necessary to prevent damage to the work.

All dewatering shall be performed at the Contractor's sole expense and shall be considered as included in the contract unit price(s) for the facility being constructed. The sides of excavations shall be sloped as required by soil conditions to stabilize the sides for safe working conditions. The quantities of excavations for said sloping will not be measured for payment. The backfilling shall be done with suitable materials as approved by the Engineer, at Contractor's expense.

h) Classification of Excavation

Delete the whole paragraph

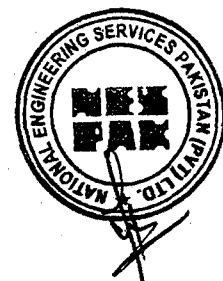
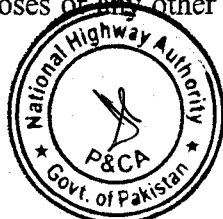
**107.3.2 Excavation in Embankments**

In para 3, line 3, delete "also" and substitute with "Also"

**107.3.3 Backfill**

Add the following para at the end:

Any temporary backfill or platform constructed by the Contractor for piling purposes or any other work item(s), its preparation, construction and removal



of this work by the Contractor shall not be measured for payment. Its cost shall be deemed included in the respective pay item.

**107.4 MEASUREMENT AND PAYMENT**

**107.4.1 Measurement**

a) Structural Excavation

In para 1, line 2, between "position" and "computed" insert "below top soil"

Add at the end of para (1) the following:

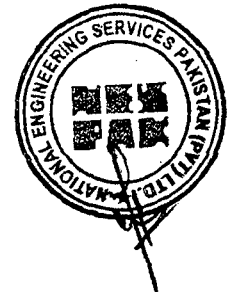
However the stability of the structural excavation shall be the responsibility of the Contractor for which he may use any appropriate means including shoring and / or excavation along a suitable slope line without any extra payment.

In para 3, sub-para (1), add at the end:

"Neat lines of footings or foundations shall mean the outer faces of footings or foundations excluding lean concrete.

After para 4, at the end, add the following para:

"No separate payment shall be made for compaction of excavated foundation under structures".



## ITEM 108 FORMATION OF EMBANKMENT

### 108.1 DESCRIPTION

Add at the end of para.

The work shall also include the compaction, trimming and shaping of the side slopes as shown on the plans and removal of any excess fill as directed by the Engineer prior to placement of top soil on slopes of the embankment where required.

### 108.2 MATERIAL REQUIREMENTS

Add the following at the end of 1<sup>st</sup> para.

Wet excavated material which will be suitable when dry and if approved by the Engineer shall first be allowed to dry before being placed in the embankment. If the Contractor wishes to replace the wet (suitable) material with dry material that can be easily compacted to the required density to save his time, the same shall be done at no extra cost to the employer.

b) Delete and replace with following table;

CBR of the material with regard to depth of embankment shall be as follows

Depth of Embankment	CBR at 95% MDD
0 – 30 cm	25%
Below 30 cm	7%

Add after (d)

- e) In case non-cohesive material is used for embankment formation, it shall be properly confined at no extra cost, with a cohesive material having Liquid Limit not more than 25 and Plasticity Index not more than 6 or as approved by the Engineer.
- f) For the purpose of embankment and subgrade construction the following shall be considered as unsuitable materials:
- 1) AASHTO soil classification group of A6 and A7;
  - 2) Material from swamps, marshes and bogs;
  - 3) Peat, logs, stumps, garbage and perishable materials;
  - 4) Material susceptible to spontaneous combustion;
  - 5) Organic Soils, as determined by ASTM D 2487-83 or USBR Earth Manual.



- f) The moisture content of the soil at the time of compaction shall be optimum to achieve the compaction up to the specified density. The maximum dry density and optimum moisture content shall be determined from moisture density test (AASHTO T-180 Method D) performed on different type of soil to be used in the construction of the work. Optimum moisture content and the moisture range required for the soil to achieve the desired compaction shall be approved by the Engineer. The soil shall be compacted at optimum moisture content with +1 % to -2 % tolerances, commensurate with the soil type, unless otherwise directed by the Engineer.

When compaction is determined by "Relative Density Test" then tolerance for moisture content shall be finalized during the compaction trial and approved by the Engineer.

### **108.3 CONSTRUCTION REQUIREMENTS**

#### **108.3.1 Formation of Embankment with Borrow Common Material**

After 1<sup>st</sup> para add following:

If suitable material is not available in the Project area, the Contractor shall blend granular material with locally available soils which are otherwise unsuitable (as per category 1 of 108.2e), to achieve a uniform blend that meets the material requirements stated above without any additional cost to the Employer. Such widely divergent materials may be mixed, sampled and tested outside the embankment limits and the mixture may be used as a proposed source of borrow material as outlined in Section 108.2. However, the Contractor will submit his method statement to the Engineer and get it approved before proceeding with the work. Approval of this method statement by the Engineer shall not relieve the Contractor of his responsibility to use the suitable material in the Works. Material for embankment, obtained and approved as provided above, shall be placed in horizontal layers of uniform thickness and in conformity with the lines, grades, sections and dimensions shown on the Drawings or as required by the Engineer. The layers of loose material other than rock shall be not more than 20 cm. thick, unless otherwise allowed by the Engineer after a trial section is prepared and approved for each material source and/or borrow area.

Delete para 7

Delete last para and replace it with the following:

Side slopes shall be neatly trimmed to the lines and slopes shown on the drawings or as directed by the Engineer, and the finished work shall be left in a neat and acceptable condition. The slopes of the design road cross-section shall be trimmed and compacted to the densities as specified above for different zones". No surplus material shall be permitted to be left at the toe of embankment or at the top of cut section.

#### **Relative Density Test**

For cohesion-less free-draining soils for which impact compaction will not produce a well-defined moisture density relationship curve and the maximum density Test



for Relative density of Cohesion-less soils ASTM D-4253/4254 shall be used to determine the relative density.

Relative density is defined as the state of compactness of a soil with respect to the loosest and densest state at which it can be placed by the laboratory procedures described in the ASTM D-4253/4254. The field Density and actual Moisture Content of the compacted embankment shall be determined by field tests according to AASHTO T 191.

### 108.3.5 Formation of Embankment in Water Logged Areas

Delete 1<sup>st</sup> and 2<sup>nd</sup> paras and replace with the following:

In places where excessive moisture is encountered in natural ground and movement of heavy machinery is not possible as it creates soft spots and movement in ground, all such areas shall be left undisturbed for such period that the top surface dries up and forms a crust. The Contractor shall prepare a moisture profile up to a depth of 1.5 meters.

A blanket layer of 60 cm or more (up to one (01) meter) shall be placed in two lifts in the following manner:

- Material stocked at one end of the subject area.
- The material is then pushed by dozer making a lift of 30 cm. (or half the thickness of total lift)
- The dozer should only move on the spread material making sure that no machinery shall move on natural ground.
- After completing one stretch, the area is proof rolled. Material for 2<sup>nd</sup> lift is again stocked at one end and pushed by dozer in the similar manner as 1<sup>st</sup> lift.
- After completing the 2<sup>nd</sup> lift, the top 15 cm is compacted to 90% of maximum dry density.
- Vibration of roller shall not be allowed on blanket layer in any case.
- After approval of this layer, further filling shall be carried out as per standard procedure of 15 cm compacted layer.

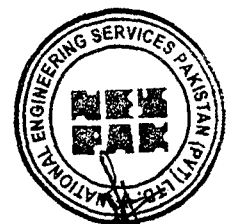
The material of blanket layer/working platform shall be as per clause 108.2 (d) and paid under item 108 c.

It should also be checked that selected grading is such that intrusion into the blanket/working platform material of sub-grade or natural ground surface material is not allowed.

For this condition to be met it will be required that the ratio as below shall be checked and followed:

$$\frac{\text{D15 - (Granular Fill Material)}}{\text{D85 - (Natural Ground Material)}} < 5$$

D15 and D85 mean the particle diameters corresponding to 15% and 85% respectively, passing (by weight) in a grain size analysis.



At the end of clause 108.3.5 add the following:

When the roadway profile is so low that after construction of the lower part of the embankment using a "bridging lift" will not permit the placement and compaction of fifty (50) centimeters of acceptable embankment material, Contractor shall prepare a proposal to raise profile of the embankment and submit it to the Engineer for his approval.

Boulders and rock fragments larger than twenty (20) centimeters in maximum dimension shall not be placed in the embankment any closer than fifty (50) centimeters from top of the subgrade.

Embankment settlement period for critical section, where height is greater than 5.0 meter, is approximately three (3) months. Embankment therefore, shall remain in place for the required settlement period before placing the 30 cm thick subgrade layer.

### **108.3.6 General Requirements**

At the end add the following:

Embankment filling shall be brought up and compacted over the full width of the embankment of the carriageways in one operation in layers parallel with the sub-grade level. At no time shall any part of the embankment width under one carriageway be left more than one layer lower than any other part of the embankment width.

Shoulder construction shall be brought up simultaneously with the pavement construction. In order to prevent water penetration into the pavement layers during construction, shoulder and median construction shall be brought up simultaneously with the pavement construction.

Embankment side slopes shall be neatly trimmed to the lines and slopes shown on the drawings or as directed by the Engineer and the finished work shall be left in a neat and acceptable condition.

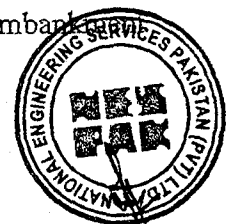
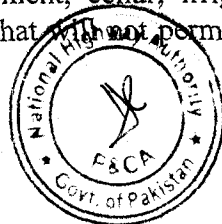
### **108.3.7 Formation of Embankment with A-3 Material**

The construction of embankments with A-3 material shall be accomplished as shown on the plans, specified in Particular Specifications and Special Provisions or as directed by the Engineer. Construction of embankment with A-3 material shall be carried out in a series of operations as follows:

Edge berms shall first be constructed along both sides of the staked embankment, except where the embankment is to be constructed against hillsides or existing embankment, using Class A-1, A-2 or A-2-4 soils from roadway excavation or borrow or any other source which can resist erosion by wind and water and are approved by the Engineer. However, if Engineer so approved A-4 material having PI value 4-8 from borrow excavation can be used for confinement. Edge berms shall be constructed with an external side slope as shown on the plans or specified in these Particular Specifications and Special Provisions, but not steeper than one (1) vertical to three (3) horizontal. Edge berms shall be constructed not more than thirty (30) centimeters in height w.r.t A-3 embankment and not less than 2.0 meters wide at the top. The materials shall be placed and spread in layers as specified in these Specifications and compacted as specified in Table 108.3.1.

### **108.3.8 Formation of Embankment on Existing Structures**

When an embankment surface is to be constructed over an area previously occupied by a building basement, cellar, irrigation canal, well, any previous excavation, or other such construction that will not permit the use of normal compaction equipment, the embankment



construction shall conform to the backfilling requirements specified in Structural Backfilling in these Specifications, until the normal compaction equipment can be used. The material shall be compacted to the density specified for the adjacent embankments.

**108.3.9 Trial Section**

Before starting the filling of the embankment, the Contractor shall construct trial sections of minimum 200 meters and maximum of 500 meters or as directed by the Engineer with each soil type / source proposed to be used as fill material. The soils used in the trials shall be the same as those intended to be used for the formation of embankment and the compacting equipment shall be the same that the Contractor will use for the main work.

The construction of embankment with any type of soil / material source shall be subject to written approval of the Engineer after the trial section made for that particular type of soil/material source.

The objective of these trials shall be to determine the optimum moisture content and the relationship between the number of passes of compacting equipment and density obtained for the soil types under trial and for the verification of the soil type itself. No separate payment will be made for this work, which shall be required as a subsidiary obligation of the Contractor under Pay Item Nos. 108a, 108b or 108c, as the case may be. The Engineer may order additional compaction test sections when deems necessary.

**108.4.1 Measurement**

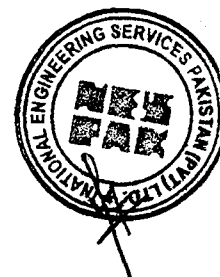
**iii) Formation from Roadway Excavation**

In para 1, last line, delete "&108b"

**108.4.2 Payment**

Replace the table as under:

Pay Item No.	Description	Units of Measurement
108a	Formation of Embankment from Roadway Excavation in Common Material	CM
108c	Formation of Embankment from Borrow Excavation in Common Material	CM
108d	Formation of Embankment from Structural Excavation	CM



## ITEM 109 SUBGRADE PREPARATIONS

---

### 109.2.3 Subgrade Preparation in Earth Cut

Delete para one and two and replace with the following:

In case bottom of subgrade level is within thirty (30) cm of the natural ground, the top  $\leq$  fifteen (15) cm material shall be removed and stockpiled at a nearby location. The exposed surface shall then be scarified, broken up, adjusted to optimum moisture content and compacted to minimum density of ninety five (95) percent of the maximum dry density as determined by AASHTO T-180 Method D. Second layer of sub-grade shall then be prepared by incorporating the above mentioned stockpiled material to ensure that the depth of sub-grade layer is thirty (30) cm.

In case, the bottom of sub-grade is below the natural ground by more than thirty (30) cm, the material above the top of sub-grade shall be removed and subsequent layer of thirty (30) cm shall be prepared in two layers as per the method describe above.

At the end add the following:

Subgrade of thirty (30) cm. shall in any case be prepared and compacted in two layers of fifteen (15) cm. each.

### 109.2.8 Protection of Completed Work

Add at the end:

It will be at discretion of the Engineer to check some or all such reaches for compaction and moisture content before placing the next layer.

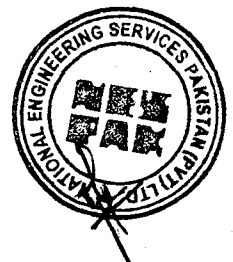
### 109.2.9 Templates and Straightedges

Delete and replace by following:

The Contractor shall provide for the use of the Engineer, satisfactory templates and straightedges in sufficient numbers to check the accuracy of the work, as provided in these specifications and no subsequent work shall be permitted until the sub-grade levels have been checked and approved by the Engineer.

### 109.2.10 Finishing Tolerances and Requirements

Quality Assurance measuring or testing shall involve verification that the sub-grade is constructed, timely finished and trimmed in a neat, workmanlike manner to the lines, grades and typical cross sections shown on the Plans or staked by the Engineer within the required tolerances.





**ITEM 201 GRANULAR SUBBASE**

**201.2 MATERIAL REQUIREMENTS**

Delete para 1 and replace it with the following:

“Material for Subbase shall consists of hard durable crushed gravel, crushed rock and crushed stone fragments and shall be cleaned and free from dirt organic matter and other deleterious substances and shall be of such nature that it can be compacted readily under water and rolling to form a firm stable subbase.”

In para (a):

Delete first sub-para including the table and replace with the following:

- a) The Sub-base material shall conform to gradation requirement as specified in ASTM D-2940 and given below:

Grading Requirements for Crushed Aggregate Sub-base Material		
Sieve Designation		Mass Percent Passing
mm	Inch	
50.0	2	100
37.5	1½	90-100
25.0	1	78-92
9.5	3/8	50-73
4.75	No. 4	30-60
2.00	No. 10	24-50
0.425	No. 40	13-32
0.075	No. 200	0-12

The final gradation decided within the limit designated in the table shall be all graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieves or vice versa.

Gradation requirements shall not apply on Broken Pavement Material (Asphalt layer/TST is not included) from existing road except passing at 0.075 mm sieve, being reused as Sub-base.

In para (e), line 4, delete “6” and insert “4”



**201.3 CONSTRUCTION REQUIREMENTS**

**201.3.5 Moisture Content Determination**

Delete para (b).

Same size of sample should be placed in oven for moisture determination in case of laboratory density (Proctor) and field density to ensure compatible compaction results.

Add at the end:

**201.3.7 Protection of Completed Work**

Any part of the sub-base that has been completed shall be protected and kept well drained. Any damage resulting from carelessness of the Contractor shall be repaired as directed by the Engineer without additional payment.

The Contractor shall be responsible for all the consequences of traffic being allowed to ply on the sub-base. He shall repair any ruts or ridges occasioned by his own traffic or that of others by reshaping and compacting with rollers of the size and type necessary for such repair. He shall limit the area of sub-base preparation to an area easily maintained with the equipment available. Sub-base preparation and placing of aggregate base course shall be arranged to follow each other closely. The sub-base, when prepared too soon in relation to the placing of the aggregate base course, is liable to deteriorate, and in such case the Contractor shall, without additional payment, repair, reroll, or re-compact the sub-base as may be necessary to restore it to the state specified herein.

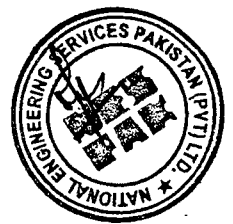
It will be at discretion of the Engineer to check some or all such reaches for compaction, moisture content and surface irregularities before placing the next layer.

**201.4 MEASUREMENT AND PAYMENT**

**201.4.2 Payment**

Replace the table of Pay Items by the following:

<b>Pay Item No.</b>	<b>Description</b>	<b>Unit of Measurement</b>
201a	Granular Sub-base (Crushed Aggregate)	CM
201b	Re-use of Broken / Salvaged Granular Material from existing road as Sub-base	CM



## ITEM 202 AGGREGATE BASE COURSE

### 2.2.2 MATERIAL REQUIREMENTS

Delete this Section completely and replace as follows:

Material for crushed aggregate base course shall consist of crushed hard durable gravel, rock or stone fragments. It shall be clean and free from organic matters, lumps of clay and other deleterious substances. The material shall be of such a nature that it can be compacted readily under watering and rolling to form a firm and stable base for both flexible and rigid pavements.

The aggregate base shall comply with the following grading and quality requirements.

- a) The gradation curve of the material shall be smooth, well graded and within the specified allowable tolerances and the envelope.

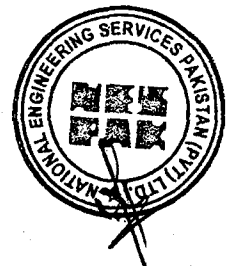
The grading table as per ASTM D 2940 given below:

Grading Requirements for Crushed Aggregate Base Material		
Sieve Designation		Mass Percent Passing Grading
mm	Inch	
50.0	(2)	100
37.5	(1.5)	95-100
19.0	(3/4)	70-92
9.5	(3/8)	50-70
4.75	No. 4	35-55
0.600	No. 30	12-25
0.075	No. 200	0-8

The final gradation decided within the limit designated in the table shall be all graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieves or vice versa.

This material shall be obtained by mechanically crushing the material retained on 3" size sieve.

The material shall be well graded so that the coefficient of Uniformity



D60/D10 shall be greater than four (4).

- b) The material passing the 19 mm sieve shall have a CBR value of minimum eighty (80) percent, tested according to the AASHTO T-193 / ASTM D-1883. The CBR value shall be obtained at the maximum dry density determined according to AASHTO T 180, Method D.
- c) The Coarse aggregate shall have a percentage of wear by the Loss Angeles Abrasion test (AASHTO T-96) of not more than forty percent (40%).
- d) The fraction passing the No. 200 sieve shall not be greater than two third of the fraction passing the 0.425 mm (No 40) sieve.
- e) The portion of filler, including any blended material, passing No. 40 mesh sieve shall have a liquid limit not more than 25 and a plasticity index not more than 6 as per AASHTO T 89 & T 90
- f) The sand equivalent determined according to AASHTO T-176 shall not be less than 45.
- g) Crushed Aggregate (material retained on sieve No. 4) shall consist of material of which hundred (100) percent by weight shall be crushed particles having a minimum one fractured face and at least ninety (90) percent by weight shall be crushed particles, having a minimum of two (2) fractured faces.
- h) The material shall have a loss of less than twelve (12) percent when subjected to five cycles of the Sodium Sulphate Soundness test according to AASHTO T-104.
- i) Flat, elongated, soft and disintegrated pieces shall not exceed 10 % of total volume of Crushed Aggregate Base Course.
- j) Friable particles tested according to AASHTO T-112 shall not exceed 0.25 %.

#### 202.2.1 Filler for Blending

In the table change Plasticity Index value from "6 maximum" to "4 maximum" and Sand Equivalent value from "30 minimum" to "45 minimum"

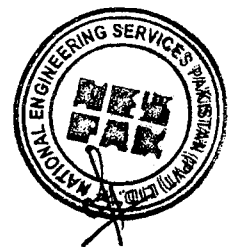
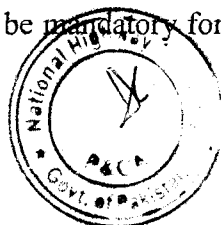
#### 202.3 CONSTRUCTION REQUIREMENTS

Delete this Section completely and replace as follows:

##### 202.3.1 Mixing of Aggregate Material

Mixing of different sizes of aggregate and stone dust shall be mixed in the central mixing plant/pug-mill at proper moisture content. Mixing at site or over prepared sub-base shall not be allowed in any case.

It shall be mandatory for the Contractor to lay aggregate base course in specified



thickness, line and grade on approved surface using mechanical paver. Dumping the aggregate base material on prepared sub-base and spreading with motor grader will not be allowed. The paver shall be power propelled unit, provided with automatically controlled screeds and feed controls capable of spreading the aggregates and maintaining specified thickness and grade. The paver shall be equipped with receiving hoppers having sufficient capacity for a uniform paving operation. The paver shall be operated at a constant speed to give best results. The mechanical paver has to be approved by the Engineer's Representative prior to start of paving activity.

**202.3.2 Preparation of Surface for Crushed Aggregate Base Course**

In case crushed aggregate base is to be laid over approved sub-base course, the sub-base course shall not have loose material or dried / over moist condition w.r.t optimum moisture content.

**202.3.3 Compaction Process**

Compaction process shall conform in all respect to the requirements specified under this heading in Item 201 (201.3.3).

**202.3.4 Compaction Requirement**

The relative compaction of each layer of the compacted base shall not be less than 100 percent of the maximum dry density determined according to AASHTO T-180, Method D after adjustment of coarse particles obtained during field density test (retained on 19 mm sieve or 4.75 mm sieve whichever is applicable) as per AASHTO Method T-224. The field density shall be determined according to AASHTO T-191.

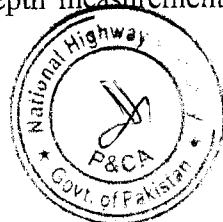
Completed base course shall be maintained in an acceptable condition at all times until prime coat is applied. When base course is to carry traffic for an indefinite length of time before receiving surfacing, the Contractor shall maintain the surface until final acceptance and shall prevent releveling by wetting, blading, rolling and addition of fines as may be required to keep the base tightly bound and leave a slight excess of material over the entire surface which must be removed and the surface finish restored before application of prime coat.

**202.3.5 Moisture Content Determination**

Moisture content determination shall conform in all respects to the requirements specified under clause 201.3.5 for sub-base.

**202.3.6 Trial Sections**

Prior to commencement of crushed aggregate base course operations, a trial section of two hundred (200) meters minimum, but not to exceed five hundred (500) meters shall be prepared by the Contractor using same material and equipment as will be used at site to determine the adequacy of equipment, loose depth measurement necessary to result in the specified compacted layer.



field moisture content, and relationship between the number of compaction passes and the resulting density of material.

### **202.3.7 Surface Tolerance**

Grade control shall be accomplished by means of grade stakes, steel pins or forms, placed in lanes parallel to the centerline of the road and at intervals sufficiently close to permit placing of string lines or straightedges for checking purposes.

The surface layer of the crushed aggregate base course shall be evaluated for compliance with the following surface tolerances:

- a) The cross section of the finished aggregate base surface shall be checked by the Contractor in the presence of the Engineer at maximum intervals of twenty-five (25) meters and at intermediate points as directed by the Engineer.
- b) The allowable tolerances in design elevation of the finished base are stated in "Table for Allowable Tolerances" in these Specifications.

Isolated deviations below the design elevation shall be compensated by additional thickness of the subsequent pavement layer. Additional cost and materials resulting from deviations from the design elevation shall be borne by the Contractor.

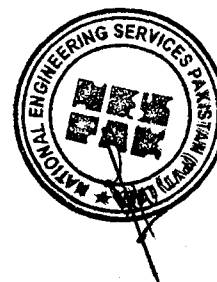
### **202.3.8 Acceptance, Sampling and Testing**

Acceptance of sampling and testing with respect to materials and construction requirements shall be governed by the relevant, "Table for Sampling and Testing Frequency" or as approved by the Engineer.

### **202.3.9 Protection of Completed Work**

Any part of the aggregate base course that has been completed shall be protected and kept well drained. Any damage resulting from carelessness of the Contractor shall be repaired as directed by the Engineer without additional payment.

The Contractor shall be responsible for all the consequences of traffic being allowed to ply on the aggregate base course. He shall repair any ruts or ridges occasioned by his own traffic or that of others by reshaping and compacting with rollers of the size and type necessary for such repair. He shall limit the area of aggregate base course preparation to an area easily maintained with the equipment available. Aggregate base course preparation and placing of asphalt base course shall be arranged to follow each other closely. The aggregate base course, when prepared too soon in relation to the placing of the asphalt base course, is liable to deteriorate, and in such case the Contractor shall, without additional payment, repair, reroll, or re-compact the aggregate base course as may be necessary to restore it to the state specified herein.

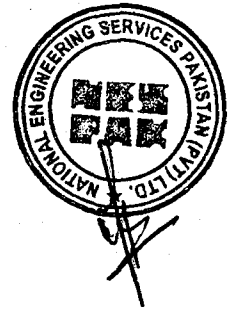


It will be at discretion of the Engineer to check some or all such reaches for compaction, moisture content and surface irregularities before placing the next layer.

**202.4.2 Pavment**

Replace the pay Item table as follows:

<b>Pay Item No.</b>	<b>Description</b>	<b>Unit of Measurement</b>
202	Aggregate Base Course (Mixing in Central mixing Plant/ Pugmill and Laid with Mechanical paver)	CM



## **ITEM 203 ASPHALTIC BASE COURSE (HOT PLANT MIX)**

Delete the entire item and replace it by the following:

### **203.1 DESCRIPTION**

This work shall consist of furnishing plant, labor, equipment, materials, mixing aggregates and asphalt binder and additive material (where required) at a central batch asphalt mixing plant, to a specified temperature, hauling, including loading unloading, laying and compacting the mixture on an approved primed sub-grade, sub-base or base course in accordance with these Specifications and in conformity with the lines grades and typical cross-sections shown in the Drawings or as directed by the Engineer.

### **203.2 MATERIAL REQUIREMENTS**

#### **203.2.1 Mineral Aggregate**

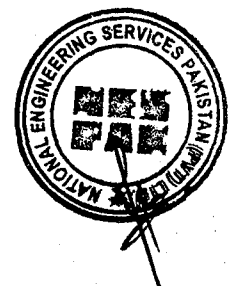
Mineral aggregate for bituminous base course shall consist of coarse aggregate, fine aggregate and filler material, if required, all conforming to the following requirements:

Coarse aggregate which is the material retained on AASHTO No. 4 sieve shall consist of crushed rock, crushed gravel or crushed boulder. It shall be clean, hard, tough, sound, durable, and free from decomposed stones, organic matter, shale, clay lump or other deleterious substances. Rock or boulders, from which coarse aggregate is obtained, shall be of uniform quality throughout the quarry.

The crushing shall be so regulated that (material retained on sieve # 4) shall have all faces crushed without any uncrushed surface. The type of source shall be uniform throughout the quarry location from where such a material is obtained. Rock to be crushed for use as bituminous concrete aggregate, shall be screened in such a manner that all material to be crushed is retained on a 75 mm (3") screen.

Fine aggregate which is material passing No. 4 sieve, shall consist of 100% crushed material from rock and shall be stored separately. No natural sand will be allowed in the mix.

When the combined grading of the coarse and fine aggregates is deficient in material passing No. 200 sieve, additional filler material shall be added. The filler material shall consist of finely divided rock dust, including dust from plant collection system, hydrated lime, hydrated cement or other suitable mineral matters free of deleterious material conforming to the requirements of AASHTO M-17. However, in case the coarse aggregates are of quartzitic nature, then hydrated lime or a better material shall be required. At the time of use, it shall be sufficiently dry to flow freely. Filler material shall conform to following gradation:



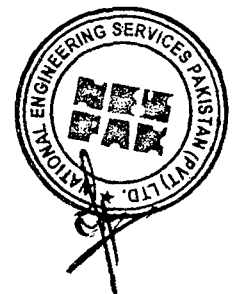


US Standard Sieve	Percent Passing by Weight
No. 30	100
No. 50	95 – 100
No. 200	70 – 100

The ratio of filler to binder should range from 1.0-1.5.

The coarse and fine aggregates shall meet the following requirements:

- a) The coarse aggregate shall have a percentage of wear by the Los Angeles Abrasion test (AASHTO T-96) not more than forty (40).
- b) The coarse and fine aggregates shall have a Specific Gravity value of not less than 2.60 and value for absorption of water not more than 2% as determined by AASHTO T 84 and T 85.
- c) The material shall have a loss of less than twelve (12) percent when subjected to five cycles of the Sodium Sulphate Soundness test according to (AASHTO T-104).
- d) The Sand Equivalent (AASHTO T 176) determined after all processing except for addition of asphalt cement shall not be less than forty five (45).
- e) The fine fraction of the material shall have a liquid limit not more than twenty five (25) and a Plasticity Index (as determined by AASHTO T-89 and T-90) not more than four (4). The plasticity index of mineral filler should not be more than four (4).
- f) The portion of aggregate retained on the 9.5 mm (3/8 inch) sieve shall not contain more than fifteen (15) percent by weight of flat and/or elongated particles as determined in accordance with ASTM D 4791, standard test method for flat and/or elongated pieces (ratio of maximum to minimum dimension = 3:1).
- g) The coarse aggregate when tested by the Coating and Stripping Test (AASHTO T-182) shall have a coated area above ninety five (95) percent.
- h) Petrographic examination of the coarse aggregate is mandatory for the approval of source. The coarse aggregates shall be checked for cationic and anionic behavior so that their affinity with the bitumen to be used is verified.



**203.2.2 Asphalt Material**

Asphalt binder for asphalt base course shall be asphalt cement 60-70 penetration grade, conforming to the requirement in Table 301-2 of Item Asphaltic Materials in these Specifications.

When asphalt cement 60-70 penetration grade is used, the optimum ratio between bituminous material and filler shall be so determined that the bituminous filler mixture will reach its softening point, not less than eighty (80) degree centigrade when tested in accordance with AASHTO T 53

**203.2.3 Asphalt Base/Leveling Course Mixture**

The composition of the asphalt base/leveling course mixtures for base course shall conform to classes shown in the following table:

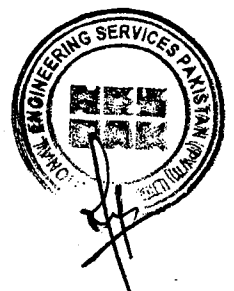
**Table 203-1**

**Combined Aggregate Grading Requirements**

<b>Mix Designation</b>	<b>Class-A</b>	<b>Class-B</b>
Use	Leveling/Base	Leveling/Base
Compacted Thickness	75-100 mm	75-100 mm
<i>U.S. Standard Sieve Size</i>	<i>Percent passing by weight</i>	
1½" (38 mm)	100	100
1" (25 mm)	75-90	90-100
¾" (19 mm)	65-80	-
½" (12.5 mm)	55-70	56-80
⅜" (9.5 mm)	45-60	-
No. 4 (4.75 mm)	30-45	29-59
No. 8 (2.38 mm)	15-35	19-45
No. 50 (0.300 mm)	5-15	5-17
No. 200 (0.075 mm)	2-7	1-7
Asphalt Content by weight of mix (%)	3 (Minimum)	

Class-B shall be used for Asphaltic Base / Levelling course unless specified otherwise by the Engineer. The grading limits specified are based on materials of uniform specific gravity and shall be adjusted by the Engineer to compensate any variation in specific gravity of individual sizes. The grading may be varied by the Engineer on the basis of Marshall Tests to obtained optimum stability and life of completed asphalt pavement. Grading limits determined by Fuller Equation (MS - 2) should be avoided.

The asphalt leveling/base course mixture shall meet the following Marshall Test Criteria:



Compaction, number of blows to each end of specimen

Stability (30 minutes/60 °C)	75 1,000 kg (Min.)
Flow, 0.25 mm (0.01 in.)	8-14 (2 – 3.5)
Percent air voids in mix	4-6
Percent voids in mineral aggregates	According to table 5.3 MS-2, Asphalt Institute sixth edition or the latest edition
Percent voids filled with asphalt	50-65
Loss of Marshall Stability	25 percent (max.)

#### 203.2.4 Job-Mix Formula

At least eight (8) weeks prior to commencement of asphalt, the Contractor shall start the tests for the design of JMF for the asphalt base course production for the Project. At least one week prior to production, a JMF for the asphalt mix to be used shall be established jointly by the Contractor and the Engineer meeting Project Specification requirements.

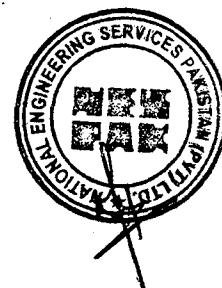
The JMF shall be established by Modified Marshall Method of Mix Design for Large Aggregate according to the procedure prescribed in the Asphalt Institute Manual Series No. 2 (MS-2), Sixth Edition, taking into account following recommendations.

The JMF, with the allowable tolerances shall be within the range specified in Item 203.2.3 and herein. Each JMF shall indicate a single percentage of aggregate passing each required sieve size and a single percentage of bitumen to be added to the aggregate.

Marshall mixing temperature shall be one hundred and sixty plus/minus five ( $160 \pm 5$ ) degree centigrade at which heated asphalt produces a kinematic viscosity one hundred and seventy  $\pm$  twenty ( $170 \pm 20$ ) centistokes.

Marshall compacting temperature shall be one hundred and forty five plus/minus five ( $145 \pm 5$ ) degree centigrade at which heated asphalt produces a kinematic viscosity of two hundred and eighty plus/minus thirty ( $280 \pm 30$ ) centistokes.

The combined gradation should produce a smooth curve within the master grading band for designated mix. The job-mix formula with allowable tolerances for a single test then becomes the job control grading band. If application of job-mix



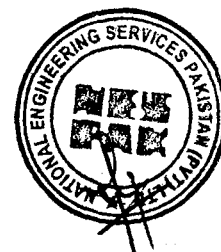
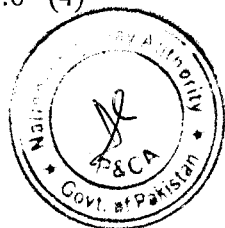
tolerances results in a job control grading band outside the master grading band, the full tolerances shall still apply. The asphalt content thus determined shall be used to check for compliance for stability, flow and voids filled, etc. as per the specifications. Minimum coating of bitumen film on aggregate should be 8 micron.

### METHODOLOGY FOR MODIFIED MARSHAL METHOD

Mixes composed of larger size aggregates with maximum size up to 38 mm (1.5 inches) will be prepared according to modified Marshall Method as per MS-2 Asphalt institute, sixth edition, 1993 or the latest edition. The procedure is basically the same as the original method except for following differences that are due to the larger specimen size that is used:

- a) The hammer weighs 10.2 kg (22.5 lb.) and has a 149.4 mm (5.88 inches) flat tamping face. Only mechanically-operated device is used for the same 457 mm (18 inches) drop height.
- b) The specimen has a 152.4 mm (6 inches) diameter by, 95.2 mm (3.75 inches) height.
- c) The batch weights are typically of 4 Kg.
- d) The equipment for compacting and testing (molds and breaking heads) are proportionately larger to accommodate the larger specimens.
- e) The mix is placed in the mold in two approximately equal increments, with spading performed after each increment to avoid honey-combing.
- f) The number of blows needed for the larger specimen is 1.5 times (75 or 112 blows) of that required for the smaller specimen (50 or 75 blows) to obtain equivalent compaction.
- g) The design criteria shall be modified as well, the minimum stability shall be 2.25 times and the range of flow values shall be 1.5 times normal-sized specimens.
- h) Similar to the normal procedure, following values shall be used to convert the measured stability values to an equivalent value for a specimen with a 95.2 mm (3.75 inches) thickness, if the actual thickness varies:

Approximate Height mm (inches)	Specimen Volume (Cubic cm)	Correlation Ratio
88.9 (3 1/2)	1608 to 1626	1.12
90.5 (3 9/16)	1637 to 1665	1.09
92.1 (3 5/8)	1666 to 1694	1.06
93.7 (3 11/16)	1695 to 1723	1.03
95.2 (3 3/4)	1724 to 1752	1.00
96.8 (3 13/16)	1753 to 1781	0.97
98.4 (3 7/8)	1782 to 1810	0.95
100.0 (3 15/16)	1811 to 1839	0.92
101.6 (4)	1840 to 1968.	0.90



Prior to final approval, the proposed job mix, with a Asphalt content at the permissible upper percentage limit determined in JMF, shall be compacted to refusal density (when density does not increase with additional compaction efforts or breakage of stones start) such that the resulting air voids in the mix shall not be less than 3%.

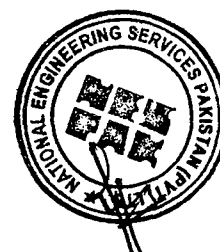
Once JMF is established, all mixtures furnished for the project represented by samples taken from the asphalt plant during operation, shall conform thereto. Moreover upon receiving the job-mix, approved by the Engineer, the Contractor shall adjust his plant to proportion the individual aggregates, mineral filler and asphalt to produce a final mix that when compared to job mix formula shall be within the following limits.

**Maximum Variation of Percentage of Materials**

Retained No. 4 and larger	± 7.0 %
Passing No. 4 to No. 100 sieve	± 4.0 %
Passing No. 200	± 1.0 %
Asphalt Content (weight % of total mixture)	-0.2% to +0.2 %

In addition to meeting the requirements specified in the preceding items, the mixture as established by the JMF shall also satisfy the following physical properties:

- a) Loss of Marshall Stability by immersion of specimen in water at sixty (60) degree centigrade for 24 hours as compared with stability measured after immersion in water at sixty (60) degrees centigrade for twenty (20) minutes shall not exceeds twenty five (25) percent. If the mixture fails to meet this criterion, the JMF shall be modified.
- b) In case mix fails to meet the stripping test requirement then anti-stripping agent shall be used for which no separate payment shall be made.
- c) Should a change of source of materials be made, a new JMF shall be established before the new material is used. When unsatisfactory results or other conditions make it necessary, a new Job Mix Formula will be required.
- d) The assistance of the Engineer in the preparation of the job standard mix in no way relieves the Contractor of the responsibility of producing an Asphalt mix meeting the requirements of the Specifications.
- e) The density of the compacted mixes shall be related to the daily Marshall Density which shall be determined by making three standard Marshall Specimens from samples of the mix taken from behind the paver. The density of each sample shall be determined and compared with the mean value. Any individual result which varies from the mean by more than 0.015 gm/cc shall be rejected. Marshall Test shall be repeated on a daily basis to establish the



- f) Daily Marshall Density for that particular day's work or one sample of 500T production. The daily Marshall Density shall not vary from the Job Mix Design Density by more than  $\pm 1.0\%$ . Loss of stability shall be tested on other three Marshall Specimens from samples of the mix taken from behind the paver.
- g) The compliance criteria contained in the Job Mix Tolerances provide an indication of the maximum acceptable value of the standard deviation for each parameter. If asphalt mix shows variation in excess of these limits, the source of variation shall be determined by the Contractor and rectified by him to the satisfaction of Project Specifications and Engineer. If the excessive variations continue, the Engineer shall order stoppage of production and laying for the Works, until the Contractor has demonstrated his ability to re-establish acceptable control.

### 203.2.5 Asphalt Additives

Hydrated lime or any other additive may be used as an anti-stripping agent as and when required. When used, hydrated lime shall be added at a rate between 1% and 2% by weight of the total mix with the aim of eliminating stripping tendencies. Hydrated lime shall be fed by a separated feeding system into pug mill for each batch. Percentage of additive and relative specifications for any other type of additives shall be based on manufacturer's specifications for the product, subject to approval of the Engineer.

No additional cost shall be paid for use of hydrated lime or any other anti-stripping additive, and payment shall be deemed to be included in the respective pay items of asphaltic base course.

## 203.3 CONSTRUCTION REQUIREMENTS

### 203.3.1 Asphalt Mixing Plant

Mixing plants used for the preparation of Asphalt Mixtures shall be batch plants conforming to AASHTO M-156, and of adequate capacity, coordinated and operated to produce a mixture within the limits of specifications. Plant shall have minimum three cold bins and at least 3<sup>1/2</sup> decks of hot sieves to effectively control the gradation of hot bins. It should be provided with facilities necessary for protection of environment such as dust control facility. Special emphasis shall be given to the following considerations:

- A large bucket to handle a batch in a single weighing.
- The mixer box shall be equipped with a dust hood to prevent loss of dust by dispersion.
- A mechanical batch counter shall be installed as part of the timing device and shall be designated to register only completely mixed batches.



- The plant shall be fully computerized batch-plant.
- The automatic proportioning system shall be capable of consistently delivering materials within the full range of batch sizes within the following tolerances:

Description	Total Batch Weight of Paving Mix %
Batch aggregate component	±1.5
Mineral filler	±0.5
Bituminous material	±0.1
Zero return (aggregate)	±0.5
Zero return (bituminous material)	±0.1

An automatic graphic or digital record shall be produced for each batch of bituminous concrete indicating the proportions of each aggregate component, mineral filler, and bituminous material. Such records of the batches shall be further identified through a print of day and date. Bituminous material proportions shall be recorded either as weight or volume.

### 203.3.2 Preparation of Aggregates

Before being fed to the dryer, aggregates for the asphalt base courses shall be separated into three or more sizes and stored separately in cold bins. One bin shall contain aggregate of such size that eighty (80) percent will pass sieve No. 4, and the other two bins shall contain aggregate of such sizes that eighty (80) percent will be retained on sieve No. 4. Should fine material, be incorporated in the mix, a separate bin shall be provided in addition to the three bins mentioned above. If filler is used as a separate component it will also be stored and measured separately and accurately before being fed into the mixer through filler screw mechanism.

Each aggregate ingredient shall be heated and dried at a temperature not to exceed one hundred and seventy (170) degree centigrade. If aggregates contain sufficient moisture to cause foaming in the mixture or their temperature is in excess of one hundred and seventy (170) degree centigrade they shall be removed from the bins and returned to their respective stock piles. Immediately after heating, the aggregates shall be screened to required sizes and stored in separate bins for batching and mixing with Asphalt material

In placing the materials in bins or in moving those from bins to the mixer, any method which causes segregation or uncontrolled combination of material of different grading shall be discontinued.

Asphalt cement shall be heated within a temperature range of hundred and thirty



five to hundred and sixty three (135-163) degrees centigrade at the time of mixing. Asphalt cement heated above maximum shown shall be considered overheated and shall be rejected and removed from job site.

Dried aggregate weighed and drawn to pug-mill shall be combined with proportionate quantity of asphalt cement according to the job mix formula. Temperature of asphalt, except for temporary fluctuations, shall not be lower than fifteen (15) degree centigrade below the temperature of the aggregate, at the time; the two materials enter into the pug-mill. In no case shall the temperature of an asphalt mix exceed one hundred and sixty five (165) degree centigrade when discharged from the pug-mill.

### 203.3.3 Hauling Equipment

Dump truck used for hauling bituminous mixtures shall have tight, clean, smooth metal beds which have been thinly coated with an approved material to prevent adhering of material to the beds. Each truck shall have a cover of canvas or of other suitable material of sufficient size as to protect the mixture from the weather. The mixture will be delivered on the road at a temperature not less than hundred and forty five plus/minus five ( $145 \pm 5$ ) degree C. Drivers of dump trucks will ensure that while reversing the vehicles, paver is not pushed back producing a hump.

### 203.3.4 Bituminous Pavers

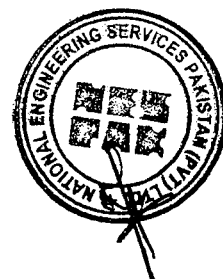
Bituminous pavers shall be self-contained, power-propelled units, provided with an automatically controlled activated screed or strike-off assembly, heated if necessary, capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and thickness shown on the plans. Pavers used for shoulders and similar construction shall be capable of spreading and finishing course of bituminous plant mix material in widths shown on the plans.

The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The paver shall be equipped with automatic feed controls, properly adjusted to maintain a uniform depth of material ahead of the screed.

The screed or strike-off assembly shall be capable of producing a finished surface of the required evenness and texture without tearing, shoving or gouging the mixture.

When laying the mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture. The paver shall be operated at speeds which will give the best result for the type of power being used.

The mixed material shall be delivered to paver in time to permit completion of spreading, finishing and compaction of mixture during day light hours.





The paver shall be equipped with automatic screed controls with sensors for either or both sides of the paver, capable of sensing grade from an outside reference line, sensing the transverse slope of the screed and providing the automatic signals which operate the screed to maintain the desired grade and transverse slope. The sensor shall be so constructed that it will operate from a reference line or a ski-like arrangement.

The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent variation.

Manual operation will only be permitted in the construction of irregularly shaped and minor areas.

Whenever a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods in order to allow the contractor to use the asphalt already produced at the plant or in transit, provided this method of operation will produce results otherwise meeting the specifications.

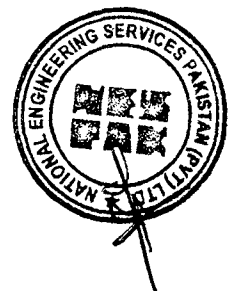
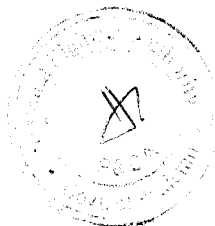
Reference lines will be required for both outer edges of the traveled way for each main line roadway for vertical control. Horizontal control utilizing the reference line will be permitted. The grade and slope for intermediate lanes shall be controlled automatically from reference lines or by means of a ski and a slope control device or a dual ski arrangement. When the finish of the grade prepared for paving is superior to the established tolerance and, when in the opinion of the Engineer, further improvement to the line, grade, cross sections and smoothness can best be achieved without the use of the reference line; a ski-like arrangement may be substituted subject to the approval of the Engineer. The use of the reference lines shall be reinstated immediately whenever the Contractor fails to maintain a superior pavement. The Contractor shall furnish and install all pins, brackets, tensioning devices, wire and accessories necessary for satisfactory operation of the automatic control equipment.

### **203.3.5 Rollers**

Rollers shall be steel wheel, pneumatic tyre and vibratory, or a combination thereof. The roller(s) shall be in good condition, capable of reversing without backlash, and shall be operated at speeds slow enough to avoid displacement of the bituminous mixture. The number and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. Vibratory rollers shall be acceptable for bituminous mixture compaction. The use of equipment, which results in excessive crushing of the aggregate, will not be permitted.

### **203.3.6 Preparation of Base or Existing Pavement Surface**

Before spreading materials, the surface of base or existing pavement on which the mix is to be placed shall be conditioned by application of a prime or tack coat as specified.



After a prime coat is applied, it shall be left undisturbed not less than forty eight (48) hours. The Contractor shall maintain the primed surface until the mix material has been placed. This maintenance shall include the spreading of sand or other approved material, if necessary to prevent adherence of the prime coat to the tyres of vehicles using the primed surface, and patching any breaks in the primed surface with additional bituminous material. Any area of primed surface that has become damaged shall be repaired before the mix is placed, to the satisfaction of Engineer. It shall be ensured that primed surface is not in tacky condition, when premix is laid.

After a tack coat is applied, it shall be allowed to dry until it is in the proper condition of tackiness to receive the mix. The tack coat shall be applied only as far in advance of the placing of mix, as is necessary to obtain the proper condition of tackiness. Any breaks in the tack coat shall be repaired.

When the surface of the existing pavement or old base is irregular, it shall be brought to uniform grade and cross-section by leveling course as directed. The leveling course mixture shall conform to the requirements of Item 203.2.

A thin coating of bituminous material shall be sprayed on contact surface of curbing, gutters, manholes, and other structures, prior to the bituminous mixture being placed against them.

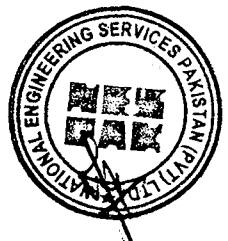
#### 203.3.7 Spreading and Finishing

The mixture shall be laid upon an approved surface, spread and struck off to the section and elevation established. Bituminous pavers shall be used to distribute the mixture either over the entire width or over such partial width as may be practicable.

Longitudinal joints for each course shall be offset thirty (30) centimeters from the joint in the immediate underlying course. Transverse joints shall be offset a minimum of sixty (60) centimeters from the joint of the immediate underlying course.

Longitudinal joints shall be located within fifteen (15) centimeters of the centerline of the roadway or within fifteen (15) centimeters of the centerline of a lane. Longitudinal joints shall be held to the minimum practical number. Longitudinal joints shall be formed by lapping the screed over the first layer placed, crowding a ridge of Asphalt material at the joint and crimping the ridge of material into the joint by a compaction roller while the material is hot.

Transverse joints shall be formed by cutting back the first layer placed to the full depth of the layer, removing and wasting the material, spreading new Asphalt material in sufficient quantity to create a compacted thickness equal to the thickness of the first layer. The joint shall be cross rolled with one coverage and the joint checked with a straight edge not less than four (4) meters in length. High points shall be removed and sags filled with additional Asphalt material and the joint rolled a second time. The joint shall again be checked with a straight edge,



humps and sags adjusted as necessary, and rolled until the joint is complete and compacted as specified.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture shall be spread, raked and luted by hand-tools. For such areas the mixture shall be dumped, spread and screeded to give the required compacted thickness, ensuring even distribution of coarse and fine material.

When production of the mixture can be maintained and wherever practical, pavers shall be used in echelon to place the wearing course in adjacent lanes and compacted to form a surface without lateral joint.

All mixtures shall be spread at a temperature of not less than hundred and forty five plus/minus five ( $145 \pm 5$ ) degree C and all initial rolling or tamping shall be performed when the temperature of the mixture is such that the sum of the air temperature plus the temperature of the mixture is between 165 degree C and 190 degree C. The mixture shall not be placed on any wet surface or when weather conditions will otherwise prevent its proper handling or finishing.

Asphalt concrete pavement asphalt base course shall not be placed on any wet or frozen surface, during rain, dust or sand storms, when wind or other weather conditions prevent the proper handling of the Asphalt mixtures or when atmospheric temperature is five (5) degree centigrade or less. Care should be taken during spreading operation under windy condition in winter, even if temperature is above five (5) degree centigrade.

The spreading operations should be immediately terminated if it begins to rain during the operation.

Hand laying of any Asphalt material will be permitted only in the following circumstances:

- a) For laying regulating courses of irregular shape and varying thickness;
- b) In confined spaces where it is impracticable for a paver to operate;
- c) For footways;
- d) At the approaches to expansion joints at bridges or viaducts;

### **203.3.8 Compaction**

After spreading and strike off and as soon as the mix condition permits the rolling to be performed without excessive shoving or tearing, the mixture shall be thoroughly and uniformly compacted. Rolling shall not be prolonged when cracks appear on the surface.

Initial or breakdown rolling shall be done by means of either a tandem steel roller



or three wheeled steel roller. Rolling shall begin as soon as the mixture will bear the roller without undue displacement.

The number and weight of rollers shall be sufficient to obtain the required compaction while the mixture is still in workable condition. The sequence of rolling and the selection of roller types shall provide the specified pavement density. Initial rolling with a tandem steel roller or a three-wheeled steel roller shall follow the paver as closely as possible.

Unless otherwise directed, rolling shall begin at the lower side and proceed longitudinally, parallel to the road centerline, each trip overlapping one-half of the roller width, gradually progressing to the crown of the road. When paving in echelon or abutting a previously placed lane, the longitudinal joint should be rolled first followed by the regular rolling procedure. On super elevated curves the rolling shall begin at the low side and progress to the high side by overlapping of longitudinal trips parallel to the centerline. Intermediate rolling with a pneumatic tyred roller shall be done behind the initial rolling. Final rolling shall eliminate marks from previous rolling. In no case shall the temperature be less than hundred and twenty (120) degree C. for initial break down rolling while all other compaction operations shall be completed before the temperature drops down to hundred and ten (110) degree C.

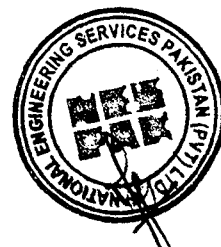
Rollers shall move at a slow but uniform speed with the drive roll or wheels nearest the paver. Rolling shall be continued until all roller marks are eliminated and a minimum density of Ninety seven (97) percent of a laboratory compacted specimen made from asphalt material obtained for daily Marshall Density is achieved.

Relevant test methods for density of bituminous concrete in place by Nuclear Methods such as ASTM D 2950 (latest version) and or other method as directed by the Engineer shall be used to establish the proper rolling effort and pattern to achieve the required density and to ensure achieving the specified percent compaction during the placement of the bituminous concrete as quality control testing. A calibration factor for the Nuclear Method must be established as per the equipment's manufacture's requirements, and at any time a change is made in the paving mixture, in construction process or after every fifteen days of asphalt production whichever is earlier. Compare the results obtained to samples compacted to Marshall Density to determine percentage of compaction.

Any displacement resulting while reversing the direction of a roller, or from other causes, shall be corrected at once by the use of rakes and addition of fresh mixture when required. Care shall be exercised in rolling not to displace the line and grade of the edges of the bituminous mixture.

To prevent adhesion of the mixture to the rollers, wheels of rollers shall be kept properly moistened with water or water mixed with very small quantities of detergent or other approved material. Excess liquid will not be permitted.

Along forms, curbs, headers, walls and other places not accessible to the roller,



the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons or with mechanical tampers. On depressed areas, tampers be used or cleated compression strips may be used under the roller to transmit compression to the depressed area.

Any mixture that becomes loose and broken, mixed with dirt, or is in any way defective in finish or density shall be removed and replaced with fresh hot mixture, which shall be compacted to conform to the surrounding area. Any area showing an excess or deficiency of bituminous material shall be removed and replaced.

Three steps of rolling are as follows:

**a) Breakdown Rolling**

Breakdown Rolling may be accomplished with static or vibratory steel-wheeled rollers. Compaction shall be carried out using rollers of approved dead weight smooth wheeled rollers or by multi-wheeled pneumatic tyred rollers of equivalent mass, or by vibratory rollers or a combination of these. Asphalt base/leveling course material shall always be surface finished with a smooth wheeled roller which may be a dead weight roller or alternatively a vibratory roller in non-vibrating mode. Vibratory rollers shall not be used in vibrating mode on bridge decks.

Vibratory rollers may only be used if they are capable of achieving at least the standard of compaction of 9-tonne dead weight roller to meet the specified percent compaction of Marshall Max. Density, and shall be equipped or provided with devices indicating the frequency at which the mechanism is operating and the speed of travel which can be read from the ground.

It is important to start the rolling operation on the low side of the mat (usually the outside of the lane being paved) and progress towards the high side. When adjoining lanes are placed, the same rolling procedure should be followed but only after compaction of the longitudinal joint.

**b) Intermediate Rolling**

Intermediate rolling with pneumatic tyre rollers and should follow breakdown rolling as closely as possible, while the asphalt mix is still well above the minimum temperature at which densification can be achieved.

Intermediate rolling should be continuous until all of the mix placed has been thoroughly compacted. Regardless of the type of rollers used, the rolling pattern should be developed in the same manner as for breakdown rolling.

**c) Finish Rolling**

Finish rolling is done solely for the improvement of the surface. It should be accomplished with steel-tired, static-weight tandems or vibratory tandems without vibration while the material is still warm enough for removal of roller



marks.

The material shall be rolled in a longitudinal direction with the driven rolls nearest the paver. The roller should first compact the material adjacent to any joints and then work from the lower to the upper side of the layer overlapping on successive passes by at least half the width of the rear roll or in the case of a pneumatic tyre roller, at least the nominal width of one tyre.

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

### **203.3.9 Frequency of Testing for Cores**

One core shall be taken for each 100 linear meter of each lane of Asphalt Base, or fraction thereof, in special cases. If the core so taken fails to achieve the specified compaction (97%), then two (2) additional cores shall be taken in the longitudinal alignment of the road at an interval of three (3) meters on either side with respect to the failing core. If all the three cores give an average of 97% compaction, and the individual compaction of any core is not less than ninety five (95) percent, then the compaction shall be acceptable. If average of the three cores further fails against compaction, then two (2) additional cores shall be taken at a distance of fifteen (15) meters on either side and compaction shall be checked for all the five cores in the same fashion. If average of five cores is 97%, the area will be accepted. In case average of 5 (five) cores is ninety six percent (96%) or more, then Engineer may withhold the payment partly and observe behavior during maintenance period, for the release of full payment or otherwise. In case of failure of the average of these five cores giving average compaction of less than 96%, the failed area shall be removed and subsequently be replaced by specified mix in an approved manner at the expense of Contractor.

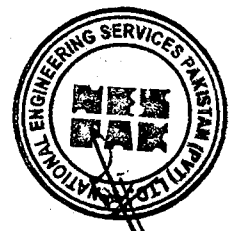
### **203.3.10 Surface Tolerances**

Surface smoothness of asphalt base/leveling course shall be measured with four (4) M straightedge by Engineer at selected locations. The variation of surface from testing edge of straightedge between any two (2) contacts shall be determined by placing it parallel and perpendicular to center-line of roadway and value thus determined should not vary more than limits prescribed by "Table for Allowable Tolerances" in these Specifications.

Any irregularities that exceed the specified tolerances or that retain water on the surface shall be corrected by removing the defective area and replacing with new asphalt base course without additional cost to the Employer.

### **203.3.11 Base Thickness Tolerances**

For determination of thickness, one (1) core for each hundred (100) linear meter of each lane shall be taken. Unless otherwise permitted, cores extracted for thickness measurement shall not be used for density determination and density cores shall not be used for thickness measurements unless permitted by the



Engineer.

When layer thickness of asphaltic base course is deficient by more than five (5) mm from that specified in the Drawings, the deficiency shall be removed with satisfactory base course material and/or made up by additional asphalt concrete wearing course thickness without extra cost to the Employer. If such remedial action is authorized, revised thickness determinations shall be made by measurements of new cores taken after placing of "Asphaltic Wearing Course" material or as directed by the Engineer. If base course deficiencies are corrected in this manner, full payment for the "Asphaltic Base Course" will be made to the Contractor, but no additional payment will be made for the increase in thickness of the "Asphaltic Wearing Course".

#### **203.3.12 Acceptance Sampling and Testing**

Acceptance of samples and testing of materials and construction requirements, shall be governed by the relevant, "Table for Sampling and Testing Frequency" or as approved by the Engineer.

#### **203.3.13 Trial Section**

At least 3 days before material from each source of the asphalt concrete is first laid in the Works, the Contractor shall lay a trial area to demonstrate the compaction plant and rolling procedure selected by him for achieving the specified density.

- a) The trial area shall be not less than 200 m in length and of a width to be approved by the Engineer. If the trial area complies with the Specifications, it may form part of the permanent Works;
- b) For the trial the Contractor shall use the materials, mixing and laying plant proposed for the main works;
- c) Where the required level of compaction is not achieved the trial area shall be removed and the trial repeated.

The Engineer shall approve test results and general performance of test area before actual commencement of the work.

### **203.4 MEASUREMENT AND PAYMENT**

#### **203.4.1 Measurement**

The quantities for asphaltic leveling / base course will be measured by volume in cubic meters compacted in place. Measurement shall be based on the dimension as shown on plan or as otherwise directed or authorized by the Engineer. No measurement shall be made for unauthorized areas or for extra thickness.



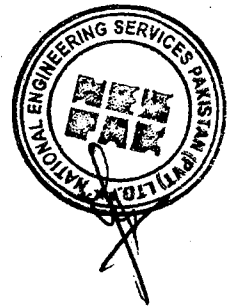
The quantity of asphaltic material used is included in the asphalt mixture and will not be measured separately.

Quantities of liquid asphalt, wasted or remaining on hand after completion of the work, shall not be measured or paid for.

**203.4.2 Payment**

The quantity determined as provided above shall be paid by volume in cubic meter compacted in place for at the contract unit price for the particular pay item listed below and shown in the Bill of Quantities, which payment shall constitute full compensation for furnishing all labour, materials, tools, plant, equipment, mixing, transporting, laying, shaping, compacting, corrections, maintenance and all the incidentals necessary for the proper completion of the work prescribed in this item. Asphalt additives or anti-stripping agent if allowed and used to meet with JMF requirement shall not be paid directly, payment shall be to be included in the respective pay items of Asphalt Base Course (Hot Plant Mix).

<b>Pay Item No.</b>	<b>Description</b>	<b>Unit of Measurement</b>
203a	Asphaltic Base / Levelling Course – Plant Mix, Class A	CM
203b	Asphaltic Base / Levelling Course - Plant Mix, Class B	CM





## **ITEM 305 ASPHALT WEARING COURSE – HOT PLANT MIX**

Delete this Item and replace with the following:

### **305.1 DESCRIPTION**

This work shall consist of furnishing and mixing aggregates, asphalt binder and additive material (where required) at a central asphalt mixing plant, to a specified temperature, hauling, including loading unloading, laying and compacting the mixture on an approved primed or tacked base, bridge deck or concrete pavement in accordance with these Specifications and in conformity with the lines grades and typical cross-sections shown in the Drawings or as directed by the Engineer.

### **305.2 MATERIAL REQUIREMENTS**

#### **305.2.1 Asphalt Material**

Asphalt Binder for Wearing Course shall be 60/70 penetration grade conforming to requirement in Table 301-2 section Asphaltic Materials in these Specifications.

When penetration grade asphalt 60/70 is used, the optimum ratio between bituminous material and filler shall be so determined that the bituminous filler mixture will reach its softening point, not less than eighty (80) degree centigrade when tested in accordance with AASHTO T 53.

#### **305.2.2 Mineral Aggregates**

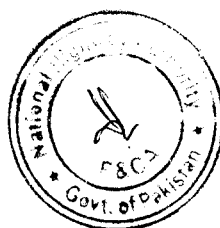
Mineral aggregates shall consist of coarse aggregate, fine aggregate and crushed rock filler material.

The coarse and fine aggregates shall be clean, hard, durable and sound particles of uniform quality, free from decomposed material, organic material, clay lumps or other deleterious substances.

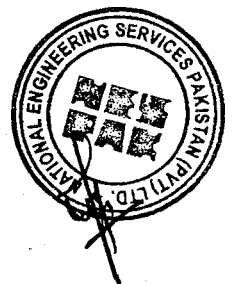
The coarse aggregate which is the material retained on sieve No. 4 (4.75mm) shall consist of crushed rock 100 % particles having all faces fractured mechanically. The working face of the quarries from which mineral aggregates are being extracted shall be acceptably uniform and be free from layers, veins or intrusions of weathered rock, soil or other unsuitable minerals.

Rock to be crushed for use as bituminous concrete aggregate, shall be screened in such a manner that all material to be crushed is retained on a 75 mm (3") screen.

Fine aggregate which is material passing an AASHTO No. 4 sieve (Khaka / Stone dust), shall consist of 100% crushed limestone from rock having all faces fractured. Fine aggregate shall be stored separately. Natural sand shall not be used in the mix.



305-1



When the combined grading of the coarse and fine aggregates is deficient in material passing the AASHTO No. 200 sieve, supplemental fine aggregate shall be mineral filler consist of finely divided rock dust including dust from the plant dust collection system or cement free of deleterious material conforming to the following grading:

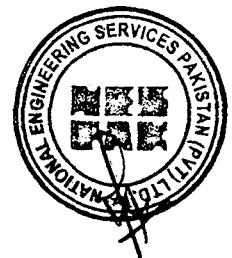
Standard Sieve Size AASHTO	Percentage Passing by Weight
No. 30	100
No. 50	95-100
No. 200	70-100

Mineral filler, at the time of use, shall be dry, free flowing, without lumps or agglomerations and conform to the requirements of AASHTO M-17.

The ratio of filler to binder should range from 1.0-1.5

The coarse and fine aggregates shall meet the following requirements:

- a) The coarse aggregate shall have a percentage loss by the Los Angeles Abrasion test (AASHTO T-96) of not more than thirty (30) percent.
- b) The coarse aggregates and fine aggregate shall have a Specific Gravity Value of not less than 2.65 & 2.60 respectively and value for absorption of water not more than 2% as determined by AASHTO T 84 and T 85.
- c) The material shall have a loss of less than ten (10) percent when subjected to five cycles of the Sodium Sulphate Soundness test according to AASHTO T-104.
- d) The Sand Equivalent (AASHTO T-176) determined after all processing except for addition of asphalt cement shall not be less than forty five (45).
- e) The fine fraction of the material shall have a liquid limit not more than twenty five (25) and a plasticity index (as determined by AASHTO T-89 and T-90) not greater than four (4). The plasticity index of mineral filler (if added separately) should not be more than four (4).
- f) The portion of aggregate retained on the 9.5 mm (3/8 inch) sieve shall not contain more than ten percent (10 %) flat and/or elongated particles (ratio of maximum to minimum dimensions = 3:1) or as determined in accordance with ASTM D 4791, standard test method for flat and/or elongated pieces.
- g) The coarse aggregate when tested by the Coating and Stripping Test (AASHTO T-182) shall have a coated area above 95 percent. In addition to this test, a test for coating and stripping shall be run after submerging the coated material in water at 60° C for 96 hours. The aggregate in this test shall have a coated area of above 80 percent.



- g) Petrographic examination of the coarse aggregate is mandatory for the approval of source. The coarse aggregates shall be checked for cationic and anionic behavior so that their affinity with the bitumen is verified.

### 305.2.3 Asphalt Concrete Wearing Course Mixture

The grading of combined aggregates prior to addition of bituminous material shall conform to gradation requirements within the following range:

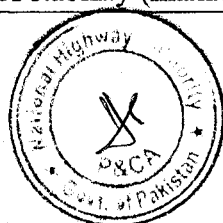
Combined Aggregate Grading Requirements as per ASTM D 3515

Standard AASHTO Sieve Sizes	Percentage Passing by Weight	
	Class A	Class B
1" (25.0 mm)	100	-
3/4" (19.0 mm)	90 - 100	100
1/2" (12.5 mm)	-	90 - 100
3/8" (9.5 mm)	56 - 80	-
No. 4 (4.75 mm)	35 - 65	44 - 74
No. 8 (2.36 mm)	23 - 49	28 - 56
No. 50 (0.3 mm)	5 - 19	5 - 21
No. 200 (0.075 mm)	2 - 8	2 - 10

The minimum binder content shall be 3.5 percent by mass of total weight of mix. The grading limits specified are based on materials of uniform specific gravity and shall be adjusted by the Engineer to compensate any variation in specific gravity of individual sizes. The grading may be varied by the Engineer on the basis of Marshall Tests to obtain optimum stability and life of completed Asphalt Concrete Pavement. Limits determined by Fuller Equation (MS - 2) should be avoided. Class A shall be adopted unless specifically advised otherwise by the Engineer.

The asphalt concrete wearing course mixture shall meet the following Marshall Test Criteria:

Compaction (number of blows each end of specimen)	75
Stability (minimum) 30 minutes/60°C	1200 kg
Flow, 0.25 mm (0.01 inch)	8 - 14 (2 - 3.5)
Percent of air voids in mix	3.5 - 5.5
Minimum voids in mineral aggregate	According to Table 5.3 MS-2, Asphalt Institute, sixth edition 1993
Percent Voids filled with Asphalt	60 - 75
Loss of stability (maximum)	20



#### 305.2.4 Asphalt Concrete Job-Mix Formula (JMF)

At least eight (8) weeks prior to commencement of asphalt production, the Contractor shall start the tests for the design of a proposed JMF as described in Subsection 305.2.3 above. At least one (1) week prior to production, a JMF for the asphalt mix to be used shall be established jointly by the Contractor and the Engineer.

The JMF shall be established by Marshall Method of Mix Design according to the procedure prescribed in the Asphalt Institute Manual Series No. 2 (MS-2), Oct; 1993 Edition or the latest edition with the following recommendations taken into account:

The JMF, with the allowable tolerances shall be within the range specified in Item 305.2.3 and herein. Each JMF shall indicate a single percentage of aggregate passing each required sieve size and a single percentage of bitumen to be added to the aggregate.

- Marshall mixing temperature shall be one hundred and sixty plus/minus five ( $160 \pm 5$ ) degree centigrade at which heated asphalt produces a kinematic viscosity one hundred and seventy plus/minus twenty ( $170 \pm 20$ ) centi stoke.
- Marshall compacting temperature shall be one hundred and forty five plus/minus five ( $145 \pm 5$ ) ° C at which heated asphalt produces a kinematic viscosity of two hundred and eighty plus/minus thirty ( $280 \pm 30$ ) centi stoke.
- The combined gradation should produce a smooth curve within the master grading band for designated mix. The job-mix formula with allowable tolerances for a single test then becomes the job control grading band. If application of job-mix tolerances results in a job control grading band outside the master grading band, the full tolerances shall still apply. The asphalt content thus determined shall be used to check for compliance for stability, flow and voids filled, etc. as per the specifications. Minimum coating of bitumen film on aggregate should be 8 micron.
- The minimum bitumen binder content according to the results of the Marshall Method of Mix Design should be used provided that it will still satisfy the durability, the stability and the void content requirements.
- The optimum asphalt content shall be based on the percent asphalt content having at least 4.0% air voids for wearing course. The asphalt content thus determined shall be used to check for compliance for stability, flow and voids filled, etc. as per the specifications. Minimum coating of bitumen film on aggregate should be 8 micron.
- Prior to final approval, the proposed job mix, with a bituminous content at the permissible upper percentage limit, shall be compacted to refusal, (400 to 600 blows) and the resulting voids in the mix shall not be less than 2%.



Once JMF is established, all mixtures furnished for the project represented by samples taken from the asphalt plant during operation, shall conform thereto. Moreover upon receiving the job-mix, approved by the Engineer, the Contractor shall adjust his plant to proportion the individual aggregates, mineral filler and asphalt to produce a final mix that when compared to job mix formula shall be within the following limits.

**Tolerances for Job-Mix Formula:**

<b>Sieve Size</b>	<b>Tolerance %</b>
19 mm (3/4") and larger	± 5
9.5 mm (3/8") and 4.75 mm (No. 4)	± 5
2.36 mm (No. 8)	± 4
300 μm (No. 50)	± 3
75 μm (No. 200)	± 1
Asphalt Content (weight % of total mixture)	-0.2 % to +0.2 %

In addition to meeting the requirements specified in the preceding items, the mixture as established by the JMF shall also satisfy the following physical property.

Loss of Marshall Stability by immersion of specimens in water at sixty (60)<sup>0</sup>C for twenty four (24) hours as compared with the stability measured after immersion in water at sixty (60)<sup>0</sup>C for twenty (20) minutes shall not exceed twenty (20) percent. If the mixture fails to meet this criterion, the JMF shall be modified or an approved anti-stripping agent shall be used. No payment shall be made for anti stripping agent.

Test results along with samples shall be presented to the Engineer for verification and final approval of JMF.

Should a change of source of materials be made, a new JMF shall be established before the new material is used. Also, if results or other conditions make it necessary a new JMF will be required.

The density of the compacted mixes shall be related to the daily Marshall Density which shall be determined by making six standard Marshall Specimens from samples of the mix taken from behind the paver. The density of each sample shall be determined and compared with the mean value. Any individual result which varies from the mean by more than 0.015 gm/cc shall be rejected. Marshall Test shall be repeated on daily basis to establish daily Marshall Density for that particular day's work or one sample for 500 T productions. The daily Marshall



Density shall not vary from the Job Mix Design Density by more than  $\pm 1.0\%$ . Loss of stability shall be tested on other three Marshall Specimens from samples of the mix taken from behind the paver.

The assistance of the Engineer in the preparation of the job standard mix in no way relieves the Contractor of the responsibility of producing a bituminous mix meeting the requirements of the Specifications.

The compliance criteria contained in the Job Mix Tolerances provide an indication of the maximum acceptable value of the standard deviation for each parameter. If asphalt mix shows variation in excess of these limits, the source of variation shall be determined by the contractor and rectified by him to the satisfaction of the Specifications and the Engineer. If the excessive variations continue, the Engineer shall order stoppage of production and laying for the Works, until the Contractor has demonstrated his ability to re-establish acceptable control.

### **305.3 CONSTRUCTION REQUIREMENTS**

#### **305.3.1 Asphalt Mixing Plant**

As per Subsection 203.3.1 of these Specifications.

#### **305.3.2 Preparation of Aggregates**

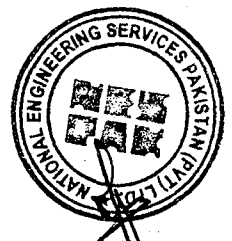
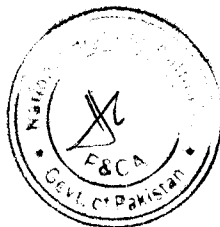
Before being fed to the dryer, aggregates for the asphalt concrete shall be separated into two or more sizes and stored separately in cold bins. One bin shall contain aggregate of such size that eighty (80) percent will pass a 2.36 mm sieve and the other bin shall contain aggregate of such size that eighty (80) percent will be retained on the 2.36 mm sieve. Should fine material be incorporated in the mix, a separate bin shall be provided in addition to the two bins mentioned above. If filler is used as a separate component it shall also be stored and measured separately and accurately before being fed into the mixer.

Asphalt cement shall be heated within a temperature range of one hundred and thirty five to one hundred and sixty three (135-163) °C at the time of mixing. All material heated above the maximum shall be considered overheated and shall be rejected and removed from job site.

Dried aggregate weighed and drawn to pug-mill shall be combined with proper amount of asphalt cement according to the job mix formula. The temperature of asphalt, except for temporary fluctuations, shall not be lower than fifteen (15) °C below the temperature of the aggregate, at the time the two (2) materials enter into the pug-mill.

In placing the materials in bins or in moving those from bins to the mixer, any method which causes segregation or uncontrolled combination of material of different grading, shall be discontinued.

Each aggregate ingredient shall be heated and dried at a temperature not to exceed



one hundred and seventy (170) degree centigrade. If aggregates contain sufficient moisture to cause foaming in the mixture or their temperature is in excess of one hundred and seventy (170) degree centigrade, they shall be removed from the bins and returned to their respective stock piles. In no case shall the temperature of an asphalt mix exceed one hundred and sixty five (165) degree centigrade when discharged from the pug-mill.

Immediately after heating, the aggregates shall be screened to required sizes and stored in separate hot bins for batching and mixing with bituminous material.

### **305.3.3 Hauling Equipment**

As per subsection 203.3.3 of these Specifications.

### **305.3.4 Laying (Spreading)**

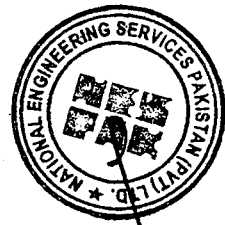
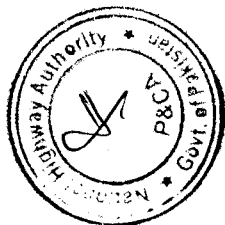
Unless otherwise directed by the Engineer, where successive layers are to be placed, the surface of existing layer shall be swept, cleaned with a power broom, or by other means as approved by the Engineer, and a tack coat is applied. Tack coat shall not be required between two lifts of Asphalt courses when previous lift is less than one day old.

Asphalt mixture shall be laid using self-contained, power-propelled units. The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The paver shall be equipped with automatic feed controls, properly adjusted to maintain a uniform depth of material ahead of the screed. It will be provided with an automatically controlled activated screed or strike-off assembly, fitted with heaters, capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and uniform thickness, required evenness and texture without tearing, shoving or gouging the mixture shown on the plans. Pavers used for shoulders and similar construction shall be capable of spreading and finishing course of Asphalt plant mix material in widths shown on the plans. The rate of delivery of material to the paver shall be so regulated as to enable the paver to be operated continuously without stoppage to ensure an even and uniform flow of material across full carriageway width, free from dragging or tearing and without segregation of the material.

When laying the mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture. The paver shall be operated at speeds which will give the best result for the type of power being used.

The mixed material shall be delivered to paver in time to permit completion of paving, finishing and compaction of mixture during day light hours.

The paver shall be equipped with automatic screed controls with sensors for either or both sides of the paver, capable of sensing grade from an outside reference line, sensing the transverse slope of the screed and providing the automatic signals



which operate the screed to maintain the desired grade and transverse slope. The sensor shall be so constructed that it will operate from a reference line or a ski-like arrangement. When the finish of the grade prepared for paving is superior to the established tolerance and, when in the opinion of the Engineer, further improvement to the line, grade, cross sections and smoothness can best be achieved without the use of the reference line; a ski-like arrangement may be substituted subject to the approval of the Engineer. The use of the reference lines shall be reinstated immediately whenever the Contractor fails to maintain a superior paving. The Contractor shall furnish and install all pins, brackets, tensioning devices, wire and accessories necessary for satisfactory operation of the automatic control equipment.

The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent variation.

Manual operation will only be permitted in the construction of irregularly shaped and or minor areas.

Whenever a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods in order to allow the contractor to use the asphalt already produced at the plant or in transit, provided this method of operation will produce results otherwise meeting the Specifications.

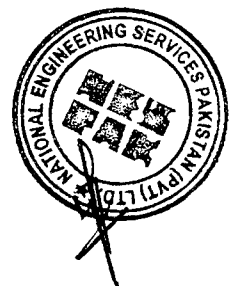
Asphalt material which is hotter than one hundred and forty (140) degree centigrade shall not be laid or deposited on bridge deck waterproofing systems unless precautions against heat damage have been agreed by the Engineer.

Asphalt concrete pavement wearing course shall not be placed on any wet or frozen surface, during rain, dust or sand storms, when wind or other weather conditions prevent the proper handling of the Asphalt mixtures or when atmospheric temperature is five (5) degree centigrade or less. Care should be taken during spreading operation under windy condition in winter, even if temperature is above five (5) degree centigrade.

The spreading operations should be immediately terminated if it begins to rain during the operation.

Hand laying of any Asphalt material will be permitted only in the following circumstances:

- a) For laying regulating courses of irregular shape and varying thickness;
- b) In confined spaces where it is impracticable for a paver to operate;
- c) For footways;
- d) At the approaches to expansion joints at bridges or viaducts;





### 305.3.5 Joints

Longitudinal joints for each course shall be offset thirty (30) centimeters from the joint in the immediate underlying course. Transverse joints shall be offset a minimum of sixty (60) centimeters from the joint of the immediate underlying course.

The Contractor will use either full width paver or two pavers in unison to avoid any longitudinal joints within the pavement width. However, where it becomes unavoidable due to break down of paver, the Contractor will ensure the leading half of half-roadway paving shall not get ahead of the trailing half of the pavement by more than half a kilometer ahead of the trailing half.

Longitudinal joints in wearing course shall, after cutting back, be of good alignment and preferably coincident with the position of carriageway markings. Except where laying in echelon, joints in wearing course shall be cut back to a vertical face and tack coated. Kerb faces, ironwork and the like in contact with wearing course shall be tack coated prior to laying of wearing course.

Longitudinal joints shall be located within fifteen (15) centimeters of the centerline of the roadway or within fifteen (15) centimeters of the centerline of a lane. Longitudinal joints shall be held to the minimum practical number. Longitudinal joints shall be formed by lapping the screed over the first layer placed, crowding a ridge of Asphalt material at the joint and crimping the ridge of material into the joint by a compaction roller while the material is hot.

Transverse joints shall be formed by cutting back the first layer placed to the full depth of the layer, removing and wasting the material, spreading new Asphalt material in sufficient quantity to create a compacted thickness equal to the thickness of the first layer. The joint shall be cross rolled with one coverage and the joint checked with a straight edge not less than four (4) meters in length. High points shall be removed and sags filled with additional Asphalt material and the joint rolled a second time. The joint shall again be checked with a straight edge, humps and sags adjusted as necessary, and rolled until the joint is complete and compacted as specified.

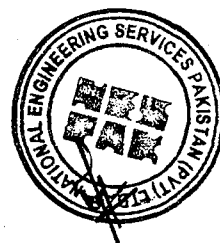
The outer edges of wearing course shall be cut back to a good alignment, parallel with the road alignment. This will require a small additional width of wearing course to be laid and cut back.

No payment shall be paid for this additional width and for all cutting back of wearing course. Tack coating of vertical faces will not be measured for payment.

### 305.3.6 Preparation of Base or Existing Pavement Surface

Before spreading materials, the surface of base or existing pavement on which the mix is to be placed shall be conditioned by application of a tack coat as specified.

After a tack coat is applied, it shall be allowed to dry until it is in the proper



condition of tackiness to receive the mix. The tack coat shall be applied only as far in advance of the placing of mix, as is necessary to obtain the proper condition of tackiness. Any breaks in the tack coat shall be repaired.

A thin coating of asphalt material shall be sprayed on contact surface of curbing, gutters, manholes, and other structures, prior to the asphalt mixture being placed against them.

### 305.3.7 Rollers

Rollers shall be steel wheel, pneumatic tyred and vibratory, or a combination thereof. The roller(s) shall be in good condition, capable of reversing without backlash, and shall be operated at speeds slow enough to avoid displacement of the asphalt mixture. The number and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. Vibratory rollers shall be acceptable for asphalt mixture compaction. The use of equipment, which results in excessive crushing of aggregate, will not be permitted.

### 305.3.8 Compaction

Asphalt material shall be laid and compacted in layer thicknesses which enable surface level and regularity requirements to be met and adequate compaction to be achieved. The maximum thickness of wearing course material laid in one pass of the paver shall be 5 cm.

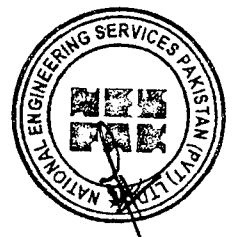
When production of the mixture can be maintained and wherever practical, pavers shall be used in echelon to place the wearing course in adjacent lanes and compacted to form a surface without lateral joint.

All mixtures shall be spread at a temperature of not less than one hundred and forty five plus/minus five (145 + 5) degree centigrade.

Material shall be uniformly compacted as soon-as-rolling can be effected without causing undue displacement of the mixed material and shall be substantially completed while the temperature of the mixed material is greater than hundred twenty (120) degree centigrade. Rolling shall continue until all roller marks have been eliminated from the surface.

The density achieved shall be not less than 97 percent of the Marshall Density of each day's production.

Relevant test methods for density of bituminous concrete in place by Nuclear Methods such as ASTM D 2950 (latest version) and or other method as directed by the Engineer shall be used to establish the proper rolling effort and pattern to achieve the required density and to ensure achieving the specified percent compaction during the placement of the bituminous concrete as quality control testing. A calibration factor for the Nuclear Method must be established as per the equipment's manufacture's requirements, and at any time a change is made in the



paving mixture, in construction process or after every fifteen days of asphalt production whichever is earlier. Compare the results obtained to samples compacted to Marshall Density to determine percentage of compaction.

Compaction shall be carried out using 8-10 tonne dead weight smooth wheeled rollers or by multi-wheeled pneumatic tyred rollers of equivalent mass, or by vibratory rollers or a combination of these. Wearing and base courses material shall always be surface finished with a smooth wheeled roller which may be a dead weight roller or alternatively a vibratory roller in non-vibrating mode. Vibratory rollers shall not be used in vibrating mode on bridge decks.

Vibratory rollers may only be used if they are capable of achieving at least the standard of compaction of 9-tonne dead weight roller to meet the specified percent compaction of Marshall Max. Density, and shall be equipped or provided with devices indicating the frequency at which the mechanism is operating and the speed of travel which can be read from the ground.

Three steps of rolling are as follows:

**i) Breakdown Rolling**

Breakdown Rolling may be accomplished with static or vibratory steel-wheeled rollers.

It is important to start the rolling operation on the low side of the mat (usually the outside of the lane being paved) and progress toward the high side. The reason is that hot mixtures tend to migrate toward the low side of the mat during compaction. If rolling is started on the high side, migration is much more pronounced than if rolling starts from the low side. When adjoining lanes are placed, the same rolling procedure should be followed but only after compaction of the longitudinal joint.

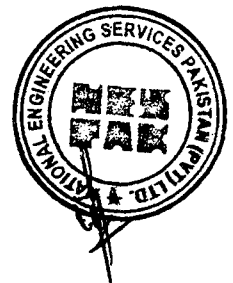
**ii) Intermediate Rolling**

Intermediate rolling should follow breakdown rolling as closely as possible, while the asphalt mix is still well above the minimum temperature at which densification can be achieved.

Intermediate rolling should be continuous until all of the mix placed has been thoroughly compacted. Regardless of the type of rollers used, the rolling pattern should be developed in the same manner as for breakdown rolling.

**iii) Finish Rolling**

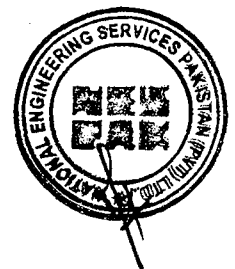
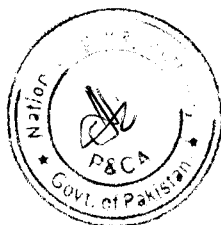
Finish rolling is done solely for the improvement of the surface. It should be accomplished with steel-tired, static-weight tandems or vibratory tandems without vibration while the material is still warm enough for removal of roller marks.



The material shall be rolled in a longitudinal direction with the driven rolls nearest the paver. The roller should first compact the material adjacent to any joints and then work from the lower to the upper side of the layer overlapping on successive passes by at least half the width of the rear roll or in the case of a pneumatic tired roller, at least the nominal width of one tyre.

The smoothness of the surface and its good acceptable ride-ability as specified shall be adhered. Following points need special attention:

- a) Variation in the surface on which the asphalt course is laid shall be free from variations and be well within the allowable tolerances.
- b) The asphalt laid through the pavers will be checked immediately after initial rolling and defects will be rectified as required.
- c) Frequent stopping/starting of paver is not allowed. Paver speed should be adjusted to average rate of delivery of material, even if some trucks are delayed in dumping loads. If stop cannot be avoided, the section of pavement at the location of stop should be checked by straightedge before and after compaction.
- d) Joint should be checked with a straightedge immediately after construction and corrections made while the material is still hot. All corrections should be made with a lute. Rakes should be used only for loosening material. Poor joints must be corrected immediately, later grinding of high spots is a poor substitute for proper construction.
- e) The paver should be adjusted so that back casting of fill in low spots is not required.
- f) Irregular rolling or letting the roller stand on hot pavement is not allowed.
- g) Non-uniform asphalt mixture shall not be allowed.
- h) Pulling of mat by screed of the paver is not allowed. This results in regularly spaced, very small, cracks in mat. The compacted mat is thinner in the vicinity of cracks due to lack of material, resulting in a corrugated surface.
- i) If the truck brakes are set too hard or the paver is bumped by a truck, irregularities occur. Truck should stop before hitting the pavers.
- j) Non-uniform temperature of material is not allowed. Cold loads do not compact to the same thickness as hot loads. The temperature of each load should be checked for uniformity as per specifications before dumping.
- k) Frequent adjustment of screed controls is undesirable. Sometimes paver crews constantly change the screed controls manually in order to maintain a uniform thickness. The result is poor riding quality.



l) Ridability of the paved surface shall be checked regularly as per 305.3.10.2.

### **305.3.9 Trial Areas**

At least 3 days before material from each source of the asphalt concrete is first laid in the Works, the Contractor shall lay a trial area to demonstrate the compaction plant and rolling procedure selected by him for achieving the specified density.

- a) The trial shall be not less than 200 m in length and of a width to be approved by the Engineer. If the trial area complies with these Specifications it may form part of the permanent Works;
- b) For the trial the Contractor shall use the materials, mixing and laying plant proposed for the main works.

Where the required level of compaction is not achieved the trial area shall be removed and the trial repeated.

The Engineer shall approve test results and general performance of test area before actual commencement of the work.

### **305.3.10 Surface Tolerances**

#### **Surface Test by Straightedge**

After completion of final rolling, the finished surface shall be tested for smoothness with five (5) meters straightedge by the Engineer at selected locations. The variation of surface from testing edge of straight edge between any two (2) contacts shall be determined by placing it parallel and perpendicular to centerline of roadway and value thus determined should not vary more than limits prescribed by "Table for Allowable Tolerances" in these Specifications.

#### **Removing and Replacing**

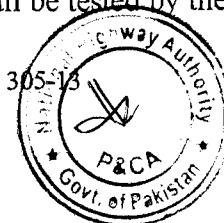
Corrections may also be made by removing the defective asphalt layer and replacing it by asphalt concrete meeting the specified requirements.

### **305.3.10 Wearing Course Thickness Tolerance**

The asphalt concrete wearing course shall be compacted to the desired level and cross slope as shown on the drawing or as directed by the Engineer.

The tolerances in compacted thickness of the wearing course shall be  $\pm 3$  mm from the desired thickness shown on the drawings. For determination of thickness one (1) core per hundred meters of each lane will be taken. If the thickness so determined is deficient by more than three (3) mm, but not more than ten (10) mm, payment will be made at an adjusted price as specified in Table-1, clause 305.4.2.(2) of these Specifications.

The surface of the wearing course shall be tested by the Engineer using



straightedge at selected locations. The variation of the surface from the testing edge of the straightedge between any two contacts, longitudinal or transverse with the surface shall at no point exceed four (4) millimeters. The cross fall (camber) shall be with  $\pm 0.2$  percent of that specified, and the level at any point shall be within  $\pm$  three (3) mm of the level shown on the Drawings. All humps or depressions exceeding the specified tolerance shall be corrected by removing the defective work and replacing it with new material, by overlaying, or by other means satisfactory to the Engineer.

### **305.3.11 Acceptance of Sampling and Testing**

The Engineer shall perform or supervise the performance of all quality assurance sampling and testing. The location of all samples and tests shall be recorded by roadway, lane and centerline station (kilometer).

Acceptance of sampling and testing for this item with respect to materials and construction requirements, not specified herein, shall be in accordance with the relevant "Tables for Sampling and Testing Frequency" in these Specifications.

### **305.3.12 Surface Smoothness**

The completed asphalt wearing course shall be compacted as specified, smooth, free from ruts, humps or depressions, or irregularities. Any ridges, indentations, roller checking, or other objectionable marks left in the surface, as determined by the Engineer, shall be eliminated by whatever means are necessary and approved by the Engineer. The use of any equipment that leaves ridges, indentations or other objectionable marks shall be discontinued.

Allowable tolerances for riding quality/smoothness of finished asphalt concrete wearing course are stated in "Table for Allowable Tolerances" and Subsection 305.3.10 in these Specifications.

### **Frequency of Testing of Cores for Compaction**—

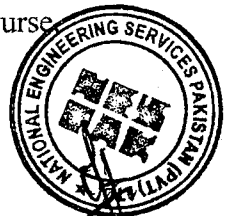
As per Subsection 203.3.9 of these Specifications.

## **305.4 MEASUREMENT AND PAYMENT**

### **305.4.1 Measurement**

The quantity of asphalt concrete wearing course shall be measured by volume in cubic meters laid and compacted in place. Measurements shall be based on the dimension as shown on the Drawings or as otherwise directed or authorized by the Engineer. No measurement shall be made of unauthorized area or extra thickness. Quantities of material wasted or remaining on hand after completion of the work shall not be measured or paid for.

Any asphalt additive used shall not be paid directly. Its payment shall be deemed to be included in the respective pay item of Asphalt Concrete Wearing Course.



**305.4.2 Payment**

- 1) The quantity determined as provided above shall be paid for at the contract unit price respectively for each of the particular pay items listed below and shown in the Bill of Quantities, which prices and payment shall constitute full compensation for all the costs necessary for the proper completion of the work prescribed in this item. Asphalt additive or anti-stripping agent, if allowed and used to meet with JMF requirement shall not be paid directly, payment shall be deemed to be included in the respective pay items of Asphaltic wearing course.
- 2) **Price adjustment:** If the thickness determined as per clause 305.3.11 of this specification is deficient by more than three (3) mm, but not more than ten (10) mm, payment will be made at an adjusted price as specified in Table-1 below:

**Table - 1**

Deficiency in thickness as determined by cores	Proportional Rate of contract Price allowed
0.0 mm to 3.0 mm	100%
3.1 mm to 5.0 mm	90%
5.1 mm to 10.0 mm	80%

When wearing course is more than ten (10) mm deficient in thickness, the contractor shall remove such deficient areas and replace them with wearing course of an approved quality and thickness or the Contractor may opt to place an additional layer of wearing course asphalt, grading with a minimum thickness of 35 mm. The Contractor will receive no compensation for the above additional work.

Pay Item No.	Description	Unit of Measurement
305a	Asphalt Wearing Course Class A	CM
305b	Asphalt Wearing Course Class B	CM



## **ITEM 401 CONCRETE**

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### **401.1.2 TYPES OF CONCRETE**

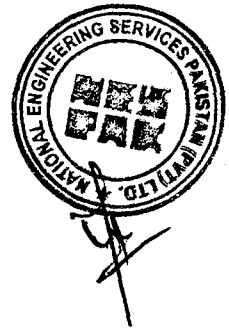
#### **“On Ground Concrete”**

In line one (1) add “minimal” after erecting. Add at the end “However walls for culvert shall be considered in elevated concrete”.

### **401.4 MEASUREMENT AND PAYMENT**

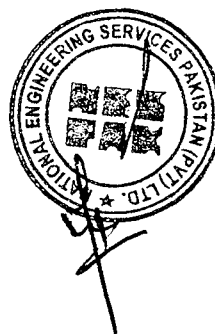
#### **401.4.1 Measurement**

In para three (03) add at the end “against per cu.m of concrete”.





# Special Provisions



**117.1      DESCRIPTION**

This work shall consist of the formation of embankment in areas of soft embankment foundation, high water levels, where compaction of natural ground is unable to achieve the density required in Item 104 with the prescribed general method. This would also include the wet areas which cannot be dried by scarifying or other measures and which exhibit moderate to severe heaving of surface during proof-rolling.

The embankment shall consist of a working platform of the granular material followed by the embankment fill material at toe of the embankment, all placed in accordance with these specifications and the specifications for other work items involved and in conformity with the lines, grades, sections and dimensions shown on the drawings or as directed by the Engineer's Representative.

**117.2      MATERIAL REQUIREMENTS**

**117.2.1      Subgrade/Embankment**

The subgrade/embankment material shall be as per Clause 109 and 108 respectively of General Specifications.

**117.2.2      Granular Material Platform**

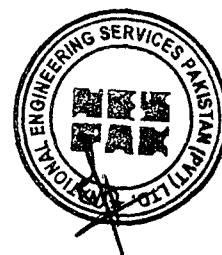
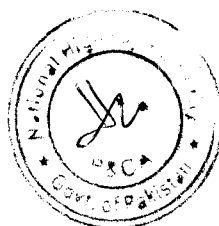
The material for the working platform shall consist of normal or processed granular fill material obtained from borrow excavation or quarry waste. This material shall conform to the following Specifications:

Size	%age of Weight Passing Mesh Sieve AASHTO T-27
37.5 mm	100
10 mm	75 - 100
# 4	60 - 80
# 10	45 - 65
# 40	25 - 40
# 100	0 - 15
# 200	0 - 5

It shall also be checked that selected grading is such that intrusion into the working platform material of subgrade or natural ground surface material is not allowed. For this condition to be met it will be required that the ratio as below shall be checked and followed:

$$\frac{D15 - (\text{Granular Fill Material})}{D85 - (\text{Natural Ground Material})} < 5$$

D85 and D15 mean the practical diameters corresponding to 85% and 15% respectively, passing (by weight) in a grain size analysis.



### 117.3 CONSTRUCTION REQUIREMENTS

#### 117.3.1 Subgrade/Embankment

The subgrade / embankment above the granular material platform shall be compacted to 95% AASHTO T-180 D regardless of zone of embankment within which it falls.

#### 117.3.2 Granular Material Platform

Prior to laying of granular material platform, the pond water of water logged area upon which embankment is to be placed, shall have been dried and drained or kept drained of all surface water prior to commencing of fill and all clearing and grubbing shall have been performed, manually if necessary, in accordance with the relevant specifications.

Construction of the granular fill layer shall proceed from one end of the soft area by using the granular fill as a ramp for further granular fill transport. The thickness of the granular fill working platform, as prescribed shall be as shown on the Project drawings or as directed by the Engineer's Representative and the width shall be that of the embankment or part as directed by the Engineer's Representative. The placement and compaction of the working platform including boxing material shall be carried out by the use of appropriate light equipment, in layers, if necessary. The placement, spreading and compaction of the Granular Material Platform shall be carried out by using light equipment. The top 15 cm of the platform shall be compacted to at least 90% AASHTO T-180 density.

In those areas of high water levels and salinity with soft subsoils and where embankments are high such as approach fills to structures, special provisions shall be made to measure and determine likely fill settlements which may occur. These preconditions are necessary in order to specify particular construction procedures which may be necessary and to establish the time at which the pavement structure can be placed to avoid cracks and subsidence of these layers.

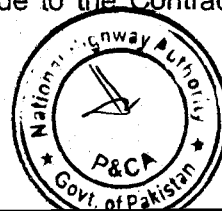
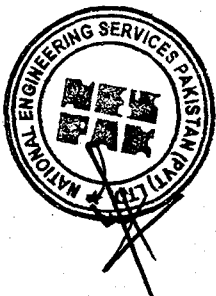
In particular, additional compaction of the fill material and its adequate protection shall be required to prevent and underscore the risk of "collapse" settlement.

No extra payment under this item shall be made to the Contractor for re-working, re-instatement, replacement of granular material which has become slushy, or replenishing of granular material for whatever reason.

### 117.4 MEASUREMENT AND PAYMENT

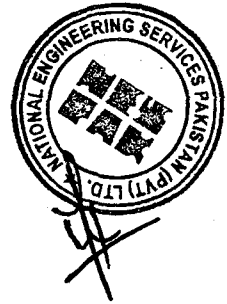
The quantities measured against this item as shown on the drawings with respect to line and grades shall be paid for at the contract unit price for the pay items listed below and shown in the Bill of Quantities. These prices and payments shall constitute full payment and compensation for providing including hauling, processing, placing at site and compacting as specified, replenishing granular material for remedying loss of material due to traffic and sinking of granular material platform during construction due to whatever reason, including all equipment, labour, material and all other costs related to the completion of works in all respects.

On first-time completion and approval of granular material platform, only 75% payment for pay item SP 117a shall be made to the Contractor. Balance 25%



payment for pay item SP 117a shall be made to the Contractor only when the granular material platform is no more required to serve as detour road and it has been re-worked, re-instated or replaced as directed by the Engineer's Representative and is re-approved and ready to receive oncoming layer of embankment.

Pay Item No.	Description	Unit of Measurement
SP-117a	Formation of Granular Material Platform.	CM



SP 117b    FORMATION OF EARTHEN DOWEL

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**117.1 DESCRIPTION**

This work shall consist of construction of earthen dowel at shoulder edge on both sides of carriageway as shown on the drawings and or as directed by the Engineer.

**117.2 MATERIAL REQUIREMENTS**

The material for earthen dowel shall be any suitable soil obtained from roadway excavation, borrow excavation or any other source as approved by the Engineer having a plasticity index of 6 or more. The material shall conform to the requirements of clause 108 of the specifications. It should be free of organic and other deleterious substances.

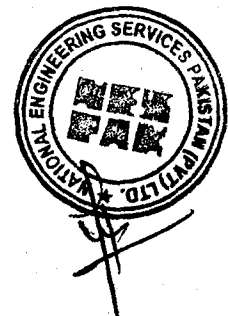
**117.3 CONSTRUCTION REQUIREMENTS**

The earthen dowel shall be constructed at shoulder edge on both sides of carriageway as per dimensions shown on drawings or as directed by the Engineer. No specific density requirements are specified for earthen dowels, it shall be as directed the Engineer. Preferably they shall be graded and compacted with at least two passes of vibratory roller to the satisfaction of the Engineer.

**117.4 MEASUREMENT AND PAYMENT**

The quantities measured against this item as shown on the drawings with respect to line and grades shall be paid for at the contract unit price for the pay items listed below and shown in the Bill of Quantities. These prices and payments shall constitute full payment and compensation for providing including hauling, processing, placing at site and compacting as specified including all equipment, labour, material and all other costs related to the completion of works in all respects.

Pay Item No.	Description	Unit of Measurement
SP-117b	Formation of Earthen Dowels.	CM



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**SP-414 SOIL INVESTIGATIONS AT BRIDGE SITES**

**414.1 SCOPE OF WORK**



The Contractor shall carry out confirmatory boring at bridge and Flyover sites at locations marked on the drawings or as directed by the Engineer's Representative.

The purpose of the Work specified herein is to determine the type, nature, arrangement, thickness and texture of the various subsurface strata, the conditions and the Engineering characteristics of the subsurface materials as they exist to the depth and at the locations specified. This is to be accomplished by means of drilling, in-situ testing, collection of disturbed and undisturbed soil and water samples and laboratory testing.

The Contractor shall carry out the specified works under the supervision of the Engineer's Representative.

#### **414.1.1 Plant and Equipment**

The Contractor shall keep at-least one rotary drill machine and one percussion winch along with accessories on the site to meet the requirements of the Work. The plant and equipment shall be in good operating condition and capable of performing efficiently the Work as set forth.

#### **414.1.2 Drillers and Supervisory Staff**

The Contractor shall provide qualified, experienced, orderly and thoroughly competent persons at all times including geotechnical engineers or engineering geologists who shall conduct and supervise drilling, sampling, logging and in-situ testing at the site. The Contractor shall remove any of his employees from the site that in the opinion of the Engineer does not meet these requirements.

The Contractor shall make his own arrangements for housing of his personnel, security and storage of the equipment and supplies at the site.

#### **414.1.3 Setting up at each Hole**

The Contractor shall make all the necessary arrangements for setting-up plant and equipment at each location, carrying out the work specified, preparation and reinstatement of the work areas, improvement to access routes and all other temporary works.

#### **414.1.4 Measurement of Quantities**

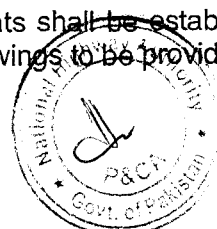
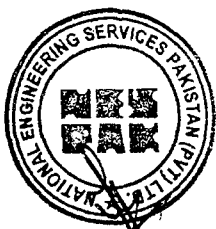
The quantities shown in the Bill of Quantities are only approximate. The payment shall be made on the basis of actual work performed in accordance with the Specifications.

#### **414.1.5 Submission of Field and Laboratory Data**

The Contractor shall supply complete field and laboratory investigation data to the Engineer's Representative within the time set-forth for completion of works. This data shall include copies of all the approved logs and test records provided during the course of the Contract including any alterations or amendments required by the Engineer's Representative.

#### **414.1.6 Location of Investigation Points**

- a) The locations of investigation points shall be established in the field by the Contractor on the basis of the Drawings to be provided later or as directed by



the Engineer's Representative. Locating the boreholes accurately in the field shall be the sole responsibility of the Contractor.

- b) It is to be understood that further Drawings may be issued by the Engineer showing the revised locations of investigation points.
- c) All the investigation points shall be located by the Contractor through field survey to an accuracy of 1 m in plan and 0.05 m in ground elevation.

## **414.2 WORK METHODOLOGY**

### **414.2.1 Investigated Areas**

The location of the boreholes will be selected as directed by The Engineer. The Engineer will specify from time to time during the Contract period, the exact location and reference number of all holes. To locate the holes accurately in the field shall however be the Contractor's responsibility.

### **414.2.2 Casing**

A hole shall be cased in any stratum which is friable or not sufficiently strong to stand unsupported, or as and when directed by the Engineer's Representative.

The Contractor shall ensure that casings are of a suitable size and inserted in such a manner as to render them recoverable. The Contract Rates for drilling shall be deemed to include the supply, insertion and recovery of casing including any damage, loss or delay caused by difficulty or failure in recovering casing.

### **414.2.3 Removal of Casing**

Casing shall neither be removed from any hole nor any filling introduced into it until permission is given by the Engineer. This permission will normally be given as soon as work in the hole is completed and the groundwater level has been measured.

As far as possible the Contractor shall avoid leaving a hole overnight after he has begun to withdraw the casing and before he has finished.

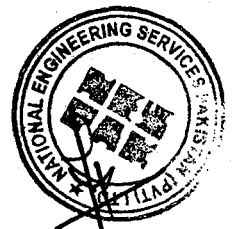
### **414.2.4 Supplementary Holes**

Abandoned holes and / or the holes from which unsatisfactory samples have been obtained and/or in which unsatisfactory field tests have been performed due to the negligence of the Contractor shall be supplemented by other holes adjacent to the original location. The exact location of such supplementary holes shall be specified by the Engineer in the field.

The depth where the unacceptable holes were abandoned or to the depths where unsatisfactory samples were obtained or unsatisfactory field testing was performed may be made by any method selected by the Contractor that in the opinion of the Engineer will permit satisfactory field testing and sampling below those depths at which original hole was abandoned shall be carried out using only the specified method of advancing the hole.

No payment will be made for that portion of the supplementary hole above the depth paid for in the unacceptable hole.

### **414.2.5 Groundwater Level**



The groundwater level in holes shall be determined after completion of the hole or when required by the Engineer, as follows:

Clear water shall be added or the hole shall be bailed-out as necessary to bring the water level to the expected groundwater level as directed by the Engineer and the water level shall be measured and recorded at intervals of 6 hours for a period of twenty four (24) hours thereafter.

#### 414.2.6 Backfilling Holes

Boreholes shall be backfilled with grout as directed by the Engineer.

Grouting for backfilling holes shall consist of a mud formed by mixing one (1) part by weight of bentonite with ten (10) parts of water, to which two parts by weight of cement shall be added after the bentonite and water have been thoroughly mixed. Alternatively, holes may be backfilled with purpose-made pellets of bentonite or bentonite/cement, provided they are of a size which, in the opinion of the Engineer, is compatible with the size of hole. If there is no standing water in the hole, grout may be poured in from the top. If there is standing water in the hole, the grout shall be fed into the bottom of the hole by a tremie pipe, the end of which shall always be below the groundwater junction while grouting is being carried out.

Grout backfill shall be taken up to 30 cm below the original ground level. Any apparent loss of grout due to leakage or consolidation within one week shall be made-up with fresh grout and then the remaining depth of the hole shall be filled with concrete.

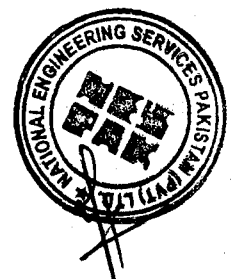
#### 414.2.7 Logs

Logs of boreholes shall be provided on an approved specimen. These shall include descriptions of all strata including details of the soil macrofabric (such as frequency, orientation and nature of fissures) and details of samples taken, and an account of all observations and field tests. Logs of boreholes shall include notes on the nature, quantity and colour of the drilling fluid returns. All logs shall be subject to the approval of the Engineer and two draft copies shall be submitted to the Engineer, not more than two days after the hole is backfilled. Soil descriptions shall conform to ASTM designation D 2488 and classified according to ASTM designation D 2487. All depths and thicknesses of topsoil and strata shall be recorded in meters and all reduced levels shall be recorded in meters with reference to Survey of Pakistan datum. Accurate determination of ground levels at all the hole points is the Contractor's responsibility for which no extra payment shall be made.

#### 414.2.8 Contractor's Responsibility for Records

The presence of the Engineer or any of his staff and their keeping separate drilling records shall not relieve the Contractor of any of his responsibilities for keeping records.

#### 414.2.9 Order of Work





The order in which the work is to be accomplished shall be determined and approved in the field by the Engineer.

#### 414.3 DRILLING

##### 414.3.1 Depth of Drilling

Drilling would generally be required up to a minimum of 45 meters depth or at least 5 m below the pile tip level, whichever is more or as directed by the Engineer.

##### 414.3.2 Accuracy of Alignment of Holes

Boreholes will be within 2 degrees of the vertical unless the Engineer's Representative has ordered the drilling of an angled hole in which case the hole angle shall be within 5 degrees of the angle specified.

##### 414.3.3 Drilling Plant

The drilling plant and ancillary equipment to be mobilized at the site should be adequate to advance the boreholes in an efficient manner, to the required depths.

Rotary drilling rigs shall be of the hydraulic feed type equipped with side discharge type fish tail and tricone bits for drilling. Bits and casing shall conform to B.S. 4019; Part I; 1974 or an approved equivalent.

Drilling bits shall be of side discharge type designed to prevent unnecessary disturbance of soil at bottom of the hole by flow of drilling fluid, unless the Engineer directs otherwise.

##### 414.3.4 Drilling Procedure

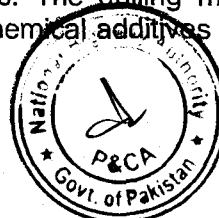
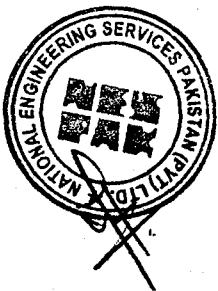
The method of drilling shall be of any approved standard and accepted method by means of which a hole of specified diameter is extended to the desired depth. The normal method of drilling shall be rotary unless gravelly strata are encountered where percussion may be used.

During drilling the Contractor shall regulate the drilling operation which ensures minimum disturbance in the underlying material in which the in-situ testing and sampling is to be carried out.

In rock, core drilling shall be carried out in such a manner and using such sizes of bits, that the maximum core is recovered. This requires close surveillance of the flushing media, drilling pressures, lengths of runs, use of appropriate core barrels and other factors relevant to the nature of the material drilled. The drill bit shall be withdrawn and core removed as often as may be necessary to secure the maximum possible amount of core. In soft or friable formation, dry drilling techniques may be required using single tube core barrel with tungsten carbide bits as directed by the Engineer. The cores would be placed in core boxes in a proper manner.

##### 414.3.5 Stabilizing of Holes

Drilling mud of suitable consistency shall be used during rotary cum wash boring to stabilize the walls of boreholes by preventing caving-in and to avoid disturbance of the sampling horizons. The drilling mud shall be a mixture of bentonite and water with approved chemical additives being used, if required, to



assist in modifying its density and viscosity. The density and viscosity shall be selected considering such factors as hole stability, cutting operation and undisturbed samples recovery.

Where drilling mud is not effective, casing of appropriate size and strength may be used subject to the approval of the Engineer. It will be responsibility of the Contractor to use appropriate means to stabilize the walls of the boreholes.

It shall be ensured that there is no jetting action of the drilling fluid. The minimum amount of drilling fluid necessary to carry away the cuttings shall be used. During drilling the Contractor shall regulate the pressure of the drilling fluid to ensure minimum disturbance to the underlying material in which the in-situ testing and sampling is to be carried out.

#### **414.4 SAMPLING**

##### **414.4.1 General**

The Contractor shall take disturbed or undisturbed samples from any borehole when ordered to do so by the Engineer. This shall include the provision of all necessary sampling equipment, tubes and containers, crates and boxes, as well as handling and transportation to the approved laboratory or store at site.

##### **414.4.2 Approval of Equipment**

No equipment or containers shall be used unless and until approved by the Engineer.

##### **414.4.3 Care of Samples**

The Contractor shall be responsible for the safe keeping of samples of all kinds until these have been handed over to the designated laboratory or disposed-of on the Engineer's instruction as the case may be. Any sample lost, damaged or showing signs of deterioration while in the Contractor's care shall be replaced by the Contractor at no expense.

##### **414.4.4 Labeling Samples**

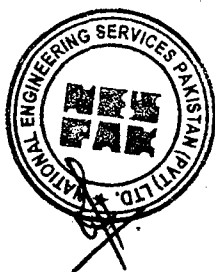
All disturbed and undisturbed soil samples and water samples taken from holes shall be clearly labeled. Each label shall include the following information:

- a) Name of Contract
- b) Reference number of the holes
- c) Reference number of sample
- d) Date of sampling
- e) Brief description of the sample (e.g. stiff brown silty clay)
- f) Depth of the top and bottom of the sample below ground level
- g) Number of the sampler tube

Tubes and crates for undisturbed samples shall be labeled "Do not jar or vibrate" and "Haul and transport in a horizontal position".

##### **414.4.5 Disturbed Samples**

In all the boreholes, small disturbed samples shall be taken at the top of each stratum, and at intervals as directed by the Engineer. Material from the cutting shoes of open drive undisturbed samples, and from the split spoon sampler used for Standard Penetration Tests, shall also be taken as disturbed samples.



#### 414.4.6 Undisturbed Sampling

Undisturbed sampling from boreholes shall be done by Shelby tube or Pitcher/Denison sampler or as directed by the Engineer. The undisturbed samples should be properly sealed and preserved as directed by the Engineer.

#### 414.4.7 Cores

The cores obtained from boreholes shall be carefully removed from the core barrel and placed in the boxes in the correct sequence, with increasing depth from left to right and top to bottom in the box. Coloured photographs of cores shall be taken at site.

Where the core is contained in an expandable triple tube liner, the ends of the tube shall be sealed and waxed as directed by the Engineer.

Each core run shall be segregated by labeled wooden blocks 25 mm thick and the depth of the bottom of each run shall be marked on the partitions in the core box with paint.

No box shall contain more than 3 meters of core.

#### 414.4.8 Core Samples

Selected cores, preferably not less than 30 cm in length, shall be preserved as core samples. The preservation would consist of clearance of any loose sludge, waxing of cores, packing in wooden boxes using sawdust and labeling before transportation to the testing laboratory.

#### 414.4.9 Water Samples

The Contractor shall take water samples from holes when directed by the Engineer before the addition of water to the hole unless it is unavoidable. If necessary, the hole shall be bailed-out before taking the sample to ensure that any potential contaminant is removed. No fuel or other potential contaminant shall be allowed to enter the hole. The method of sampling shall be as approved by the Engineer. Samples shall only be stored in approved, air tight and scrupulously clean, containers and shall not be less than 1 litre in volume.

#### 414.4.10 Transportation of Samples

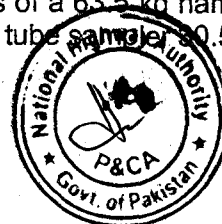
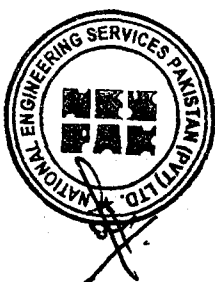
All samples shall be shifted to the store at the site, the day they are collected. Samples in tubes shall be kept and transported with the tubes in a horizontal position.

The samples shall be continuously transported to the testing laboratory on conclusion of every borehole and on the instructions of the Engineer. The laboratory for testing shall be approved by the Engineer.

#### 414.5 IN-SITU TESTS

##### 414.5.1 Standard Penetration Tests (SPTs)

When directed by the Engineer the Contractor shall carry out Standard Penetration Tests (SPTs) in boreholes. The penetration resistance 'N' shall be expressed as the number of blows of a 63.5 kg hammer freely dropping 76.2 cm required to force the standard split tube sampler 30.5 cm into the soil.



Standard Penetration Test (SPTs) shall be conducted in the boreholes in accordance with ASTM 1586 generally at 1 meter depth interval or as directed by the Engineer at the site.

#### 414.6 LABORATORY TESTING

##### 414.6.1 General

The samples shall be tested in a laboratory approved by the Engineer. The Engineer shall have access to the laboratories to supervise and check the laboratory testing of the samples. The testing shall be carried out in accordance with ASTM, BSS or AASHTO Standards or as directed by the Engineer. The Contractor shall arrange to carry out the following laboratory tests on the specified samples of the subsoil materials. The samples to be tested and the tests to be carried out for each sample shall be specified by the Engineer.

##### 414.6.2 Type of Tests

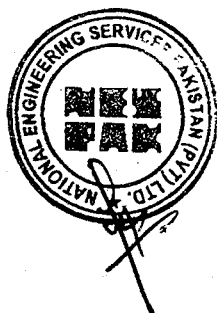
Sr. No.	Name of Test	Standard
i.	Grain size analysis	ASTM D 422
ii.	Liquid limit, plastic limit	ASTM D 4318
iii.	Specific gravity	ASTM D 854
iv.	Unit weight of soil	
v.	Unconfined compression (soil)	ASTM D 2166
vi.	Unconfined compression (rock)	ASTM D 2938
vii.	Natural moisture content	ASTM D 2216
viii.	Consolidation	ASTM D 2435
ix.	Direct shear	ASTM D 3080
x.	Triaxial compression test	ASTM D 4767
xi.	Sulphate content of Soil	BS 1377
xii.	Organic matter content of soil	BS 1377
xiii.	Total dissolved salts of soil	BS 1377
xiv.	Chloride content of soil	BS 1377
xv.	Chemical analysis of water BS 1377	
	a) Sulphate content of water	
	b) Total dissolved salts of water	
	c) Chloride content of water	
	d) pH of water	

#### 414.7 RECORDS AND REPORTS

##### 414.7.1 Records

a) The Contractor shall keep accurate logs and records of all work accomplished under this item. All such records shall be preserved in good condition and order by the Contractor until these are delivered and accepted by the Engineer. The Engineer shall have the right to examine such records at any time prior to their delivery to him. Separate logs shall be made for each borehole. The following information shall be included on the logs or in the records for boreholes:

- i. Borehole number or designation and elevation of top of borehole.
- ii. Method of drilling holes.



- iii. Dates and time by depths when hole was performed.
  - iv. Type of drilling fluid used.
  - v. Depths at which samples were recovered or attempts made to collect samples along with designation, thickness and type.
  - vi. Record of SPT on borehole log.
  - vii. The classification or description by depth of the materials samples including a description of condition of compactness or stiffness of soil materials encountered and moisture conditions.
  - viii. Depth of groundwater level if encountered.
  - ix. Depth of bottom of borehole.
- b) The Contractor shall furnish the Engineer with the record as specified above in duplicate, not later than 48 hours after completion of each borehole.
- c) The presence of Engineer or the keeping of separate records by the Engineer shall not relieve the Contractor of the responsibility for the work specified in this Section. Payment shall not be made for any work for which the records have not been furnished by the Contractor.

#### 414.7.2

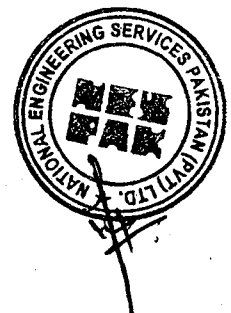
#### Reports

- a) The results of each borehole and the field tests carried out shall be communicated to the Engineer as follows:
- i. Oral reports as the work proceeds.
  - ii. Three sets of complete data of the work within two (2) days of the date of completion of borehole.
- b) The data shall comprise:
- i. A site plan showing the position of the boreholes and giving their map reference.
  - ii. The borehole logs
  - iii. Complete results of field tests
  - iv. Comments on any point which the Engineer has put-up to the Contractor for inquiry and investigation during the Works.
- c) Complete results of laboratory tests shall be communicated to the Engineer within seven (07) days of the date of completion of borehole.

#### 414.8

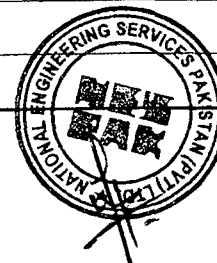
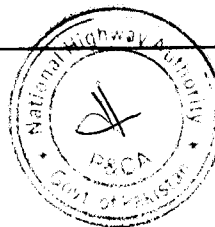
#### MEASUREMENT AND PAYMENT

The measurement and payment for the Work specified in the Contract for drilling of bore holes, collection of disturbed, undisturbed and rock core samples, performing the standard penetration tests, laboratory testing and compilation and submission of results shall be done and paid for as per the pay item given in the BOQ, which payment shall be full compensation for furnishing all labour, material, tools, equipment and incidentals and for performing all the work involved in this item as mentioned above in this specification.



Pay Item No.	Item Description	Unit
SP-414 (a)	6" minimum dia drilling straight rotary/ Percussion including back filling of holes from NSL upto 45m depth or till the rock level which ever is met earlier.	LM
SP-414(b)	Perform SPT at 1 m interval i/c collection, preservation & Transportation of disturbed samples to an approved Laboratory.	No.
SP-414(b-1)	Continuous core drilling in bedrock up to a maximum of 5 m depth below rock strike level, including determination of core recovery/ RQD, preservation of core samples in core boxes, labelling, waxing of selected core samples, photography of rock cores and transportation of core samples to the laboratory. In case core recovery is less than 80% reduce run length to 0.5 m.	LM
SP-414(c)	Collection of undisturbed soil samples from boreholes using Shelby pitcher/denison sampler i/c preservation and transportation of samples to an approved Laboratory.	No.
SP-414(d)	Performance of FDT in test pits through sand replacement method i/c moisture content determination.	No.
SP-414(e)	Excavation of testpits upto 1.5 m depth along road alignment including backfilling of pits to original condition.	M
SP-414(f)	Collection of undisturbed block samples from test pits at appropriate location as directed by the Engineer.	No.
SP-414(f1)	Collection of composite bulk sample (atleast 60 kg for sandy/clayey soils and 120 kg for gravelly soils)	No.
SP-414(g)	Collection & preservation of water samples from bore holes & transportation to an approved Laboratory.	No.
SP-414(h)	Laboratory Testing	No.
i.	Grain size analysis.	No.
ii.	Hydrometer analysis.	No.
iii.	Atterberg limits	No.
iv.	Specific gravity	No.
v.	Natural moisture content	No.
vi.	Bulk density & Dry density (Soil/rock cores)	No.
vii.	Direct shear test	No.
viii.	Consolidation test (collapse/swell potential)	No.
ix.	Unconfined compression test (Soil/rock cores)	No.
x.	Chemical analysis of soil	No.
xi.	Chemical analysis of water	No.
xii.	Submission of Investigation Report (triplicate)	No.
xiii.	CBR	No.
xvi.	Modified Proctor Test	No.

SP-



**1. General**

Expansion joints will follow Specifications of AASHTO-SS-Division II-section 19 "Bridge deck joints seals"

The Contractor shall submit to the Engineer, complete documentations about the Expansion joints he intends to use for the movements shown on the Drawings, including references of the last 10 years, material Specifications for metal, rubber and bonding between them, fixations, and test certificates from authorized laboratories showing that the proposed joints meet the specifications.

Elsewhere the submittal will be accompanied by samples of at least 0.50m, with its fixations.

The expansion joints shall satisfy the following functional requirements:

1. It shall withstand traffic loads of the highway, and accommodate movements between the deck and abutment or the adjacent deck.
2. It shall have good riding quality and shall not cause any inconvenience to road user.
3. It shall not cause skidding hazard.
4. It shall not generate excessive noise or vibration during the passage of vehicles
5. Parts liable to wear out shall be easily replaceable.
6. It shall be watertight and will have provision for carrying away water and silt.
7. It shall be easy to inspect and maintain.
8. It shall be resistant in hot and very sunny climate.

**2. Construction Requirements**

The methodology of placing the expansion joint will be clearly described by the Contractor with a complete set of drawings.

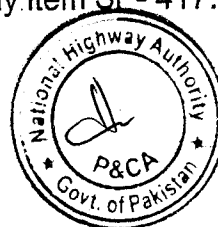
Connection or overlapping between roadway and walkway expansion joints will be clearly shown.

Connection with water proofing of the deck will be detailed.

All necessary provisions in deck reinforcement will be indicated.

Initial gap at the time of placing will be clearly indicated and justified.

The second stage reinforced concrete for fixations, if any, will be Class Y concrete and will be included in pay item SP- 417.



**3. Measurement and Payment**

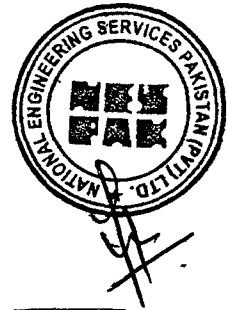
**3.1 Measurement**

The length of computed joints for roadway is measured in linear meter between the faces of the kerbs, plus 150 mm height on each bridge railing.

**3.2 Payment**

The accepted quantity measured as provided above shall be paid for at the contract unit price respectively for the pay items listed below and shown in the Bill of Quantities which price and payment shall be full compensation for furnishing all materials, labour, equipment, tools and incidentals and any work pertaining to expansion joints and which is not paid for separately, necessary to complete the item.

<b>Pay Item No</b>	<b>Description</b>	<b>Unit of Measurement</b>
SP-416	Manufactured trade mark expansion Joints for roadway, for (25-30) mm movement	M





417.1 **Scope**

The work under this section of the Specifications consists of furnishing all plant, labour, equipment, appliances and materials and in performing all operations related to water proof treatment to foundations and basement structures complete in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the Contract.

417.2 **Submittal**

Samples of all materials proposed for use under this section shall be submitted to the Engineer for approval.

417.3 **Materials**

Bitumen 10/20 grade.

417.4 **Delivery Storage and Handling**

Materials shall be protected from damage during loading shipment delivery and storage. Non-staining materials shall be used for blocking and packing.

417.5 **Preparatory Work**

All surfaces to be treated shall be dust free and dry. Application of finishes shall not start unless the preparatory work has been inspected and approved by the Engineer.

417.6 **Bitumen Coating / Painting In Foundation Sub-Structures, Under Floors**

**Bitumen Painting**

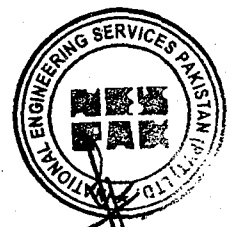
All surfaces to be bitumen painted shall be thoroughly cleared of any accretion, dust, dirt etc. by scraping, wire brushing or as directed by the Engineer. The surface shall be primed with a coat of asphalt oil used at the rate of not less than 0.5 liters per square meter. Two coats of hot bitumen paint shall be applied at the rate of 1.0 kg/Sq.m each coat. The first coat shall be allowed to dry for about 6 hours before applying the second coat. During operation of painting great care shall be taken to avoid air bubbles. The manufacturer's instructions shall be followed.

417.7 **Measurement and Payment**

417.7.1 **Bitumen Coating**

417.7.1.1 **Measurement**

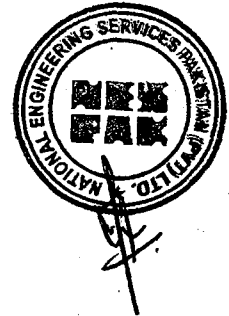
Measurement for compliant completed works will be made on the basis of actual area coated in square meter as shown on drawings or as directed by the Engineer. All openings left in area shall be deducted.



417.7.1.2 **Payment**

Payment will be made for agreed measured quantity of work on the basis of unit rate per square metre quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

Pay Item No	Description	Unit of Measurement
SP-417	Bitumen Coatings to Cement or Concrete surface using 0.60 Kg/sq.m.	SM



**614.1 DESCRIPTION**

The work shall consist of supply and installation of delineators /angle reflectors at locations detailed on drawings or as directed by the Engineer, complete in all respect. The work will be executed as per item 607 "Traffic Road Signs and Safety Devices of general specifications with amendments as follows:

In item 607 "Traffic Road Signs and Safety Devices" of general specifications, add in line 1, after "furnishing" insert ",", delete "and" and after "traffic signs" insert "and delineators"

Add at the end of para:

Unless otherwise shown on the Drawings, all signs shall be lettered in both Urdu and English. In case of any discrepancy between NTRC requirements and General Specifications, the requirements of NTRC shall govern.

**614.2 MATERIAL REQUIREMENTS**

In item 607 "Traffic Road Signs and Safety Devices" of general specifications, add new para under head "Material Requirement" as follows:

Materials shall be of new stock unless otherwise shown on the Drawings or ordered by the Engineer's Representative and shall conform to the item 607 of general specifications with amendments as mentioned below:

**614.2.2 Rubber Washer**

In 607.2.6, Add at the end "Thickness of rubber washer is as given below:

On top	3 mm
On Bottom	2 mm

**614.2.3 Concrete Foundation Blocks**

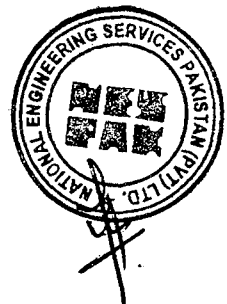
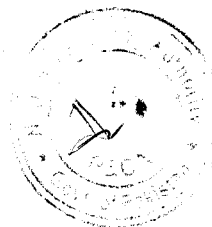
In 607.2.9, in line 1, delete "Class A" and replace with "Class A1".

In line 3, after "mm", add "or as shown on the drawings or as directed by the Engineer."

**614.2.4 Road Posts and Hazard Markers**

In 607.2.10, in line 6, delete "with standing" and replace with "withstanding".

**614.2.4 Excavation and Backfilling**



In 607.3.1, Add at the end of para 3:

Concrete shall be placed against the undisturbed excavated faces, except that the top fifteen (15) centimeters of each footing shall be formed. Forming of the entire footing will not be permitted unless approved by the Engineer. Concrete shall be thoroughly rodded and spaded so as to eliminate all voids. Tops of footings shall be finished with a wood float and all exposed edges shall be rounded with an edger.

Backfill shall be thoroughly compacted by mechanical tampers, and care taken to prevent damage to the finished concrete. Backfill shall be brought up level with the finished ground line. Pipe post bases and/or posts set in concrete shall be firmly supported, plumb, vertical and at the proper elevation.

In case precast concrete foundations are used, these shall be of the concrete class 'A1' and of the sizes as shown on the drawings.

**614.2.5 Erection of Posts**

In 607.3.2, In line 3, delete "the" written in between "to" and "prevent".

**614.2.6 Installations of Safety Devices**

In 607.3.5, In line 11, delete "a" written in between "for" and "prohibiting".

**614.2.7 Sign Faces**

In item 607.3.6, following amendments be made as mentioned below:

**a) Design**

In serial No. 3, line 1, delete "italics" and replace with "Smalls".

In serial No. 4, delete "21 cm" and replace with "35 cm".

In serial No. 5, delete "17 cm" and replace with "25 cm".

In serial No. 5, delete "italics" and replace with "Small".

In serial No. 6, delete "3.5 cm" and replace with "10 cm".

In serial No. 10, delete "4 cm" and replace with "2.3 cm".

In serial No. 11, delete "23 cm" and replace with "35 cm".

In serial No. 13, delete "Size of letter for km. Height" and replace with "Height of letter for km".

**614.2.8 Storage of Signs**



After 607.3.7, add the following:

**614.2.9 Painting**

The rear sign face of all signs shall be painted with two (2) coats priming paint pigmented with chromates of chromes (excluding lead chromes) plus two (2) coats of weather-resisting dull silver gray paint. Where connection of large aluminum sheet signs to a steel stiffening frame is required, the studs or screws, bolts and washers shall be painted to properly match the color of the surrounding material.

All painting shall conform to the requirements of Section 413 of General Specifications.

**614.2.10 Placement and Orientation**

— The Engineer will approve and mark the longitudinal location of each sign on the working drawings submitted by the Contractor.

The sign shall be laterally positioned from the shoulder or curb as shown on the approved drawings or directed by the Engineer.

The Contractor shall stake the location of each sign support and shall get its approval from the Engineer prior to carrying out excavation for foundations. The Engineer may order change in location due to site constraints. No separate payment shall be made to the Contractor on account of such change if the change is made before fixing of the sign support in concrete block.

The Contractor shall be responsible for the proper elevation, off-set, level and orientation of all signs he erects. He shall exercise due care on the preservation of stakes for his and the Engineer's use. If any stakes are lost, damaged, displaced, or removed, the Contractor shall have them reset at his own expense.

Unless otherwise shown on the drawings all signs shall be erected so that the edge and face of the sign are truly vertical and face is at an angle of ninety three (93) degrees to the centerline; that is, facing slightly away from the centerline of the lane which the sign serves. Where lanes divide or are on sharp curves, the Contractor shall orient sign faces as indicated on the Drawings or by the Engineer so that they will be most effective both during day and night and so as to avoid specular reflection and glare. All sign supports shall be plumbed.

**614.2.11 Sign Posts**

Lengths of posts shown on the drawings for signs are for bidding purposes only. When progress of the work permits, the Engineer will authorize the location of each sign, with the station and offset distance from the edge of pavement. The Contractor shall be responsible for determination of post lengths to provide the vertical clearance shown on the drawings. Field cutting of posts shall be performed by sawing.



"Sign Post Support Assemblies" shall be fabricated as detailed on the drawings. Test specimens for pipe shall be taken at least fifteen (15) centimeters from one (1) end of the pipe, instead of at the ends as specified in ASTM A 53, Grade B. When Galvanizing is specified assemblies shall be hot-dip galvanized after fabrication. All welds shall be mechanically cleaned before Galvanizing. Galvanized materials on which the Galvanizing has been damaged in transporting, handling, or erection will be rejected or may, with the approval of the Engineer, be repaired in the field by the zinc alloy stick method. Required field welds and adjacent areas on which the Galvanizing has been damaged shall be galvanized by this same method. The zinc alloy stick shall be cast from zinc, tin, and lead in combination with fluxing ingredients. The compound shall be completely liquid at a temperature not lower than two hundred and forty six (246) degrees C. The area to be re-galvanized shall be thoroughly cleaned, including the removal of slag on welds. The surface shall be heated with an oxyacetylene torch to approximately three hundred and fifteen (315) degrees C, and the alloy stick rubbed over the surface to fix a deposit. While the alloy is still liquid, a clean wire brush shall be used to smooth the deposit evenly over the entire area being re-galvanized. If a heavy deposit or build-up is required to match the original coating, more alloys shall be added immediately to the initial bond deposit and spread with a paddle or brush until the required thickness is obtained. Edges of drilled holes shall be coated with commercially available zinc-rich paint. Shop drawings will not be required for pipe posts.

The Contractor shall furnish to the Engineer, fabricators' certifications in triplicate certifying that the material supplied conforms to all of the requirements specified.

#### 614.2.12 Fastening Signs to Sign Posts

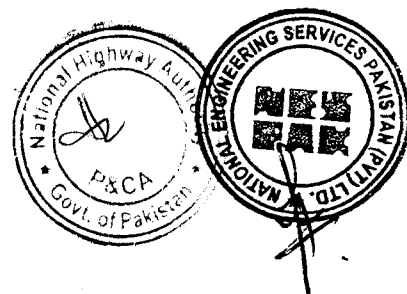
Signs shall be fastened to sign supports in accordance with the requirements of the drawings, the recommendations of the sign manufacturer and to the satisfaction of the Engineer.

After installation of signs on their supports all bolt heads, screw heads, and washers which are exposed on the face of the sign shall be painted. The color of the paint used shall be as nearly as practical the same as the color of the background or message area at the point where the bolt, screw, or washer is exposed.

Where steel signs are mounted with aluminum hardware or on steel posts, approved asphalt, nylon, or neoprene insulation shall be installed at all points where dissimilar metals might come in contact.

614.3

#### Erection of Delineators and Marker Posts



Delineators shall be erected at locations shown on the drawings and set at elevations such that the Delineator reflectors will be at the indicated height above the ground surfaces. Unless otherwise noted in the Drawings or authorized by the Engineer's Representative, holes for posts shall be of the depth and size shown on the Drawings. Posts shall be set plumb and will be set to lines and grades as specified on the drawings. The cost of all excavation and concrete will be considered subsidiary to the bid item (s) for Delineators. Chevron shall also be installed on same pattern except using high density sheet for good reflection.

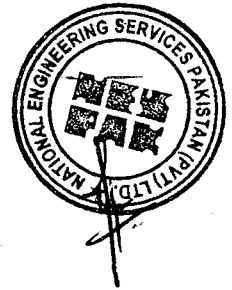
When noted on the Drawings or authorized by the Engineer's Representative, the posts shall be erected by driving, either by hand or with approved mechanical devices. The method of driving shall not substantially alter the cross-sectional dimensions of the posts or materially damage the coating. Battered tops will not be permitted. Posts which, in the opinion of the Engineer's Representative, are bent or otherwise damaged during or after erection shall be removed from the site and replaced at the Contractor's expense. After driving, the portion of the posts above ground shall be plumb and the posts shall be firm in the ground.

Reflectors shall be attached to the posts as indicated on the drawings or as directed by the Engineer or according to the manufacturer's specifications.

614.4

**PAYMENT**

Pay Item No.	Description	Unit of Measurement
SP-614	Delineators / Angle Reflector	Each



**SP-615 GANTRY SIGNS**

615.1

## GENERAL

The work shall consist of supply, fabrication and installation of gantry signs at locations as shown on drawings or as directed by the Engineer as per the site requirement, complete in all respect. Gantry signs shall be required to be installed to provide the information about the important places and restriction enforced for type of passing vehicles.

The gantry signs shall be manufactured and installed in accordance with the details shown in the gantry sign's drawings and as directed and approved by the Engineer's representative. The sign panel shall be designed suiting the situation and approved by the Engineer's representative before its manufacture.

### Gantry Sign Structure

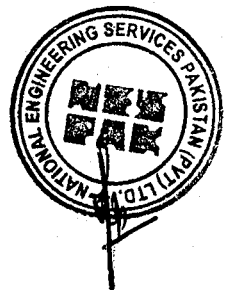
The contractor shall be responsible to submit the complete methodology and shop drawings prior to the start of any activity and get approved from the Engineer representative. All work in respect of the furnishing, construction of foundation and erection and finishing of gantry sign structure shall conform to the drawings and to the relevant requirements of General Specifications section 401 "Concrete", section 404 "Steel Reinforcement", section 413 "Steel Structures and section 607 "traffic signs and safety devices" with amendments made in SP-504.

615.2

## MEASUREMENT AND PAYMENT

The item shall be paid for as under, which price and payment shall be full compensation for all the costs necessary for the proper manufacture, installation and completion of work prescribed in the item/drawing:

Payment Item No.	Description	Unit of Measurement
SP-615a	Gantry Sign Type-I as shown on drawing	Each
SP-615b	Gantry Sign Type-II as shown on drawing	Each



SP-415

**SONIC INTEGRITY TESTS (SIT) ON ALL PILES**



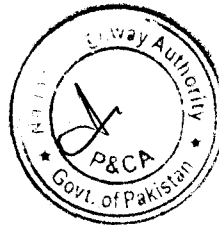
**415.1 SONIC INTEGRITY TESTS (SIT)**

All working piles shall be subjected to Sonic Integrity Testing (SIT) by a specialist agency engaged by the Contractor. The SIT equipment like FPDS (Foundation Pile Diagnostic System) or equivalent, as approved by the Engineer, shall be used for this purpose. The testing shall be done as per ASTM D5882-07. Before starting this testing, the Contractor shall submit his Method statement for approval of the Engineer.

The contractor shall arrange performance and interpretation of these tests by the specialist agency like TNO Netherlands or equivalent. The interpretation shall include information on pile length, concrete crushing strength, Sonic Pulse Velocity and defects like necking / honeycombing etc. A separate report shall be submitted for SIT carried out on piles by the Contractor.

**415.2 PAYMENT**

Item No.	Description	Unit of Measurement
SP-415	Sonic Integrity Tests (SIT) on all piles	Each



**418.1 DESCRIPTION**

The Contractor shall furnish and place galvanized iron drain pipe (AASHTO Standards M 1118-80 1986) in accordance with the plan of Bridge deck, specifications and/or as ordered by the Engineer.

**418.2 MATERIALS**

The Galvanized iron pipe shall conform to the requirements of ASTM Designation A120.

**418.3 CONSTRUCTION**

Where the pipe is used for bridge drains it shall be cast in the deck and shall be flush with the deck surface.

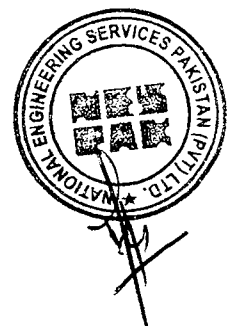
**418.4 MEASUREMENT**

The quantity to be paid for under this item will be number of linear meter of pipe incorporated in the work in accordance with the plans and specifications and as directed by the Engineer.

**418.5 PAYMENT**

The unit price bid per linear meter shall include the cost of furnishing and placement including all labor, materials and equipment necessary to complete the work.

Item No.	Description	Unit of Measurement
SP-418	GI drain pipe Dia 100 mm	M



**SP 701 PROVISIONS OF SURVEY TEAMS AND INSTRUMENTS**

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**701.1 DESCRIPTION**

The Contractor shall provide and maintain survey equipment for the sole use of the Engineer. All surveying equipment shall be new and shall be maintained throughout the Contract period and replaced by the Contractor free of charge in case of damage or loss. The survey equipment shall be supplied to the Engineer within thirty (30) calendar days from the Engineer's Order to Commence the Works.

Upon completion of the Contract, the surveying instruments and equipment shall become the property of the Employer and shall be handed over completely, and in a state of good, condition and working order taking into account fair wear and tear.

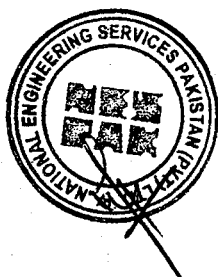
The Contractor shall provide adequate number of helpers, along with the equipment, to the Engineer/Engineer's Representative to assist in carrying out the field works.

701.2

### EXTENT OF PROVISION AND GENERAL REQUIREMENT

The Contractor shall provide and maintain at his own cost at least the following surveying equipment and any other surveying equipment deemed essential for the Work by the Engineer's Representative for the sole use of the Engineer's Representative:

Sr. No	Description	Quantity
1	<b>Electronic Total Station</b> 1" reading, 6" Accuracy, memory 10,000 points or more, Builtin SD Card Slot & USB Port, programs topographic survey, setting out, curve Guide Light, Keyboard, Automatic Dual Axis Compensator working range $\pm 6'$ distance range reflector less 400 meter with single prism 5000 meter, with Triple Prism 6000 meters, one Balley & Quick Charger in Standard Accessories (Made in Japan or Equivalent).	1 Nos.
2	Software for Data Downloading.	1 No.
3	Single Prism Target Set includes: Prism, range pole graduated 2.6m., tilting mount with Coaxial Target Plate.	4 Nos.
4	Automatic Level, magnification 32X	2 Nos.
5	Levelling Staves with graduations in metric units	12 Nos.
6	Steel measuring tapes 30 m long	4 Nos.
7	Lockable Pocket tapes 5 m.	4 Nos.
8	TRIPOD (Aluminum)	5 Nos.
9	TRIPOD for Prism Pole	4 Nos.
10	Club hammers 2 kg.	4 Nos.
11	Sledge hammers 4 kg.	4 Nos.



12	Traffic Cones	40 Nos.
13	Survey Umbrellas	6 Nos.
14	Aluminum Straight Edges, 4 m long	2 Nos.
15	Aluminum Straight Edges, 5 m long	2 Nos.
16	Spirit Levels, 30cm long	4 Nos.

- All miscellaneous tools, equipment and materials required in surveying in numbers as determined by the Engineer's Representative.

All new surveying equipment shall be provided and maintained throughout the Contract period. In case of damage or loss those shall be replaced by the Contractor at his own cost.

The Contractor shall make available two (02) qualified surveyors and transport vehicle for checking and incorporation as and when required by the Engineer's Representative.

The survey equipment shall be placed at the disposal of the Engineer's Representative during the Contract period and shall be returned to the Employer on completion of the Contract, complete and in a good state, taking into account fair wear and tear.

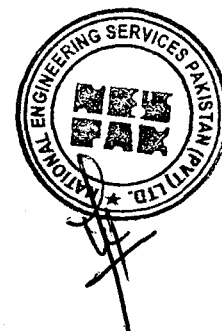
The Contractor shall provide adequate supplies of expendable materials i.e. level books, pencils, erasers inks, drawing papers, pegs, nails, flags, brushes and paints etc. as required by the Engineer's Representative.

701.3

### PAYMENT

The cost of supplying the equipment shall be paid as re-imbusement against provisional sum substantiated by vouchers from the owner plus twelve (12) percent surcharge to the contractor for administrative and overhead expenses including income tax (7.5%) related to the purchase and delivery of said items.

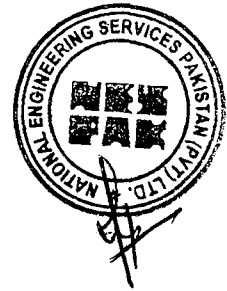
For running and maintenance, supporting staff, transport, stationery, utilities etc. shall be paid under maintenance of Surveyor Instrument.



Payment shall constitute full compensation for all costs of provision and maintenance of equipment, provision of vehicle, furnishing survey teams, supplies of expendable materials, necessary labor/helpers and all other incidental item(s) for the proper completion of the Work as stated herein

above and as directed by the Engineer's Representative:

Item No.	Description	Unit of Measurement
SP-701a	Provide Surveying and Allied Instruments.	P.S.
SP-701b	Maintain Survey Instruments, Including 2no. Helpers..	Month



**SP 702      PROVIDE EQUIP   &   FURNISH   ENGINEER'S   OFFICE   &  
ACCOMODATION**

---

**702.1      General**

The contractor shall provide a site office on rental basis against provisional sum provided in the Bill of Quantities. The site office includes the following:

- i) Office accommodation
- ii) Office furnishing and equipment
- iii) Office running and maintenance
- iv) Office supporting staff

**702.2 Engineer's Representative Office / Accommodation**

The office accommodation as approved and accepted by the Engineer shall be provided on rental basis. The overall size of the Engineer office shall be approximately 1000 Square. meters and residence accommodation of about 2,000 Square. meters having all kind of facilities.

**702.3 Furnishing & Equipment**

The furniture and equipment as approved and accepted by the Engineer shall be provided by the Contractor on the instructions of the Engineer or Representative of Engineer as per the requirement.

**702.4 Running and Maintenance**

702.4.1 The contractor shall be responsible for the running and maintenance of office accommodation, residence accommodation, furnishing and equipment etc. bills for all services/utilities to be paid by the contractor.

702.4.2 Office and Drawing Stationery and necessary equipment shall be provided by the contractor on monthly requirement basis as per the requirement or as directed by the Engineer.

**702.5 Supporting Staff**

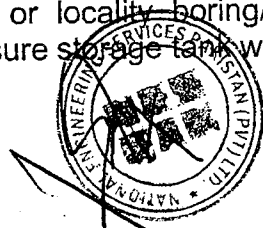
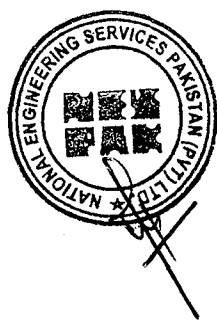
The contractor shall provide to the Engineer following supporting staff.

- |      |            |                   |
|------|------------|-------------------|
| i)   | Naib Qasid | Two               |
| ii)  | Chowkidar  | Two               |
| iii) | Cook       | Two and helper 02 |
| iv)  | Sweeper    | Two               |
| v)   | Guards     | Two               |

The appointment of the supporting staff shall be subject to the approval of the Engineer and once assigned shall not be transferred or laid off without prior approval of the Engineer.

In case of power failure and non-availability of power, electric power through generators shall also be provided by the contractor. All rooms shall be provided with standard office lighting of the flours cent type. All rooms shall have doors with locks and keys and supplied Air-conditioning and heating system as per the approval of the Engineer.

The water supply shall be maintained through water supply system of the town or locality boring/installing well with pump or by an elevated or pressure storage tank with a capacity of 2500 gallons.



A telephone shall be installed in Engineer's Office or cell phone may also be provided to facilitate the Engineer. Engineer office will be equipped with air-conditioning unit as per requirement.

702.6

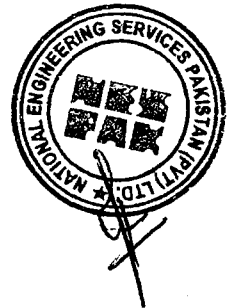
**Measurement and Payment**

For the hiring of accommodation for site office if approved & allowed by the Engineer, the cost of rent and supplying office furniture and Equipment shall be paid as re-imbusement against provisional sum substantiated by vouchers from the owner plus twelve (12) percent surcharge to the contractor for administrative and overhead expenses including income tax (7.5%) related to the purchase and delivery of said items.

For running and maintenance, office supporting staff, drawings, stationery, utilities bills etc. shall be paid under maintain of Engineer's office.

If the contractor does not provide necessary facility, Engineer shall hire the accommodation and arrange necessary supplies of furniture and equipment and employ staff etc. as specified and maintain the office. Expenditures shall be recovered from the IPC's / running bills of the contractor by adding hundred (100) percent overheads.

Pay Item No.	Description	Unit of Measurement
SP-702 a	Provide the Employer's and Engineer's Representative's Office and Residence (on rental basis)	Provisional Sum
SP-702 b	Furnish and Equip. the Employer's & Engineer's Representative Office and Residence	Provisional Sum
SP-702 c	Maintain Employer's and Engineer's Representative Office and Residence	Month



SP 703

**PROVIDE, EQUIP AND MAINTAIN LABORATORY FOR THE PROJECT**

703.1

**Description**

The work under this special provision shall be providing of three nos material testing laboratories on rental basis having minimum 500 Sq.m

covered area of each and shall be fully equipped with all necessary furnishing & equipment, utilities, installations and others as directed by the Engineer. Locations of material testing laboratories shall be as per approval / decision of the Engineer.

703.2

### **General Requirements**

The furnishing of equipment shall ensure conducting all tests related to construction as per the list provided by the Engineer. In case if any test required for testing of material cannot be performed in the project laboratory, the Engineer may authorize such test to be carried out at the cost of contractor, at any other laboratory. The Contractor shall provide at no cost to the Engineer, technicians, helpers and vehicles deemed necessary by the Engineer, to assist in the operation of the laboratories as required by the Contractor's proposed program of work. Technicians and helpers once assigned to the laboratories may be removed by the Contractor only with the approval of the Engineer and salaries shall be paid by the contractor. The equipment shall be procured within 15 days on the instructions of the Engineer.

The contractor shall maintain the laboratory equipment, apparatus and supplies necessary to permit execution of all standard test required by the specifications. Lists of specific laboratory equipment shall be provided as per the requirement and recommendation to purchase from recognized manufacturers. The Contractor shall submit to the Engineer for his approval at the earliest. The list shall include the manufacturer's name and descriptive literature. Lab Equipment, fixtures and furniture shall remain the property of the Employer after completion of the project.

703.3

### **Facility of the Material Testing**

Material testing equipment as described above shall be provided within minimum period. In case of delay in providing such facility, as an interim arrangement, temporary facilities of testing material shall be provided as agreed by the Engineer. Contractor may be paid for maintenance of temporary laboratory, provided such facilities are acceptable to the Engineer. Contractor shall also be responsible for extra expenses of the Engineer for conduction of test in temporary arrangement.

703.3.1

#### **Supporting Staff**

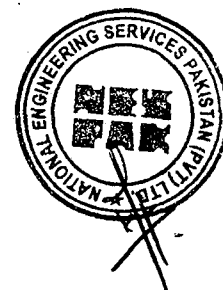
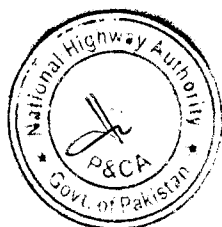
The contractor shall provide to the Engineer below mentioned supporting staff:

- |      |            |     |
|------|------------|-----|
| i)   | Naib Qasid | One |
| ii)  | Chowkidar  | One |
| iii) | Cook       | One |
| iv)  | Sweeper    | One |

The appointment of the supporting staff shall be subject to the approval of the Engineer and once assigned shall not be transferred or laid off without the Engineer approval. Salaries shall be paid by the contractor.

703.4

### **Running and Maintenance**





703.4.1 The contractor shall be responsible for the running and maintenance of Laboratory, furnishing and equipment etc. bills for all services/utilities to be paid by the contractor.

703.4.2 Office and Drawing Stationery and necessary equipment & material shall be provided by the contractor on monthly requirement basis as directed by the Engineer.

### 703.5 MEASUREMENT AND PAYMENT

#### 703.5.1 Measurement

Work under this item shall be measured in two portions.

- i) Hired the building for Material Testing Laboratory and purchase of laboratory equipment shall be paid as reimbursement against provisional sum substantiated by vouchers from the owner plus twelve (12) percent surcharge to the contractor for administrative, overhead expenses including income tax (7.5%) related to the purchase and delivery of said items.
- ii) For running / maintenance and office supporting staff, drawing stationery, Lab. Material/equipment (minor), utilities bills, helpers (06 nos.) etc. shall be paid under maintain base Laboratory. Maintain Laboratory, to be measured for the duration of the contract and paid as per the rate/month.

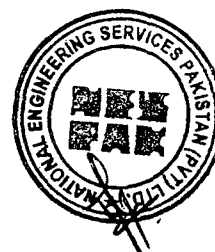
#### 703.6 Payment

The quantities under this item of work shall be paid at the contract price indicated in the Bill of Quantities which price and payment shall constitute full compensation for all costs of furnishing labor, materials, equipment and incidentals for the proper completion of the work indicated in these specifications and specified on the drawings and Special Provisions (Specification).

Pay Item No.	Description	Unit of Measurement
SP- 703 a	Provide Material Testing Project Laboratory (01 No rental basis)	Provisional Sum
SP- 703 b	Equip and Furnish Material Testing Project Laboratory	Provisional Sum
SP- 703 c	Maintain Material Testing Project Laboratory 01 Nos including 04 No Helpers	Month

### SP 708 PROVIDE, RUN AND MAINTAIN TRANSPORT FOR EMPLOYER / ENGINEER'S REPRESENTATIVE

#### 708.1 General



The transport for the Employer's / Engineer's Representative and site staff is to be provided under this Contract for which provisional sum and rate item has been provided in the B.O.Q. Contractor shall procure these vehicles under the instruction of the Engineer.

#### **Procurement of Vehicles**

The contractor shall procure the vehicles from the local market, get these registered in the name of the Employer and hand over to the Employer's and Engineer's Representative.

Details /Type of vehicles are as under:

- SP-708a : One (01) No vehicles for the Employer representatives  
(Type of vehicle will be as per the directions of Employer)
- SP-708b : Five (05) Nos. vehicles for the Engineer's representatives
- (i) 4x4 Double Cabin 2800cc (1 No.)
  - (ii) Car 1600 cc (02 Nos)
  - (iii) MPV 800cc (02 Nos)

The number of vehicles (6 nos.) covered under this provision shall be new/ latest model at the time of delivery when instructions to procure these vehicles is given as per approval of the Engineer. The vehicles shall be handed over to Employer / Engineer's Representative. The Contractor shall be responsible for the cost of running & maintenance. These vehicles shall remain the property of the Employer and shall be handed over to the Employer after completion of the work in good working condition. The cost of vehicle shall be inclusive all like purchase, transportation, registration and other dues incurred in this regard. In case new vehicles are not purchased, same numbers of road worthy conditions vehicles shall be hired and its rent cost shall be paid through pay item SP-708a, rental cost shall be approved by the Employer.

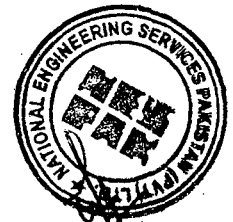
In case of delay, failure or default on the part of the Contractor in providing the facilities under these provisions, the Engineer's Representative may arrange the same at the risk and cost of the Contractor or hired the vehicles such period.

#### **708.2 Running & Maintenance**

The Contractor shall be responsible for the running and maintenance of these vehicles which includes petrol, diesel, repair works, regular tuning, replacement of tires, registration, comprehensive insurance, annual renewal, lubricants, servicing including providing drivers etc.

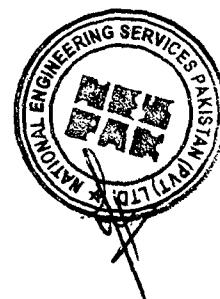
#### **708.3 Method of Payment**

On the instructions and determination by the Engineer, Contractor shall be paid for the Services under this Clause as follows:-



- i) For the procurement of vehicles Contractor shall provide the original supporting vouchers/receipts for his billing which shall be paid from the provisional sum with 10% extra cost as handling charges and income tax. In addition to that contractor shall also be paid applicable levies & other taxes but not the income tax (7.5 %) (If applicable).
- ii) For running and maintenance of above vehicles including salaries of drivers, the Contractor shall be paid on monthly basis.
- iii) On failure of the contractor to provide and of the services under this clause or even otherwise notwithstanding anything contained in any other clauses of the Contract Documents, the "Engineer" shall have the authority to nominate/sublet to any other contracting agency on recommendation of the Resident Engineer for the supply of services under this clause, the payment for which shall be made through this contract direct to the nominated agency out of Provisional Sum provided in the Contract or hire the good road worthy vehicles and recover the cost with 100% penalty charges from contractor's IPC's.

Item No.	Description	Unit of Measurement
SP-708a	Provide Employer's Representative Transport (01 Nos.)	PS
SP-708b	Provide Engineer's Representative Transport	
	(i) 4x4 Double Cabin 2800cc (1 No.)	Each
	(ii) Car 1600 cc (02 Nos)	Each
	(iii) MPV 800cc (02 Nos)	Each
SP-708c	Running & Maintenance of Employer's/Engineer's Representative Transport	Vehicle-Month



SP-715

**EMPLOYING TRAINEE ENGINEER'S WITH BOARDING, LODGING AND MESSING**

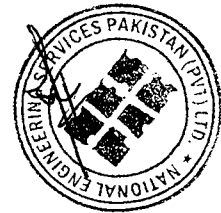
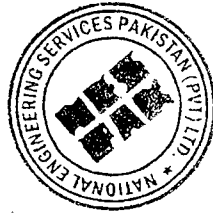
The contractor will employ Trainee Engineers after the approval of the Employer, throughout the duration as per the contract and BOQ. Each

Trainee Engineer will be given a monthly stipend Rs. 50,000 (minimum) by the contractor. The period of training of each trainee will be as per the contract. The Contractor will prepare a comprehensive training program and get it approved from NHA. It will be the contractor's responsibility for the provision of boarding & lodging of each Trainee Engineer or paid separately its cost.

**Measurement and Payment**

The number of Trainee Engineers shall be counted and paid to contractor as per the contract unit price which includes full compensation for all costs necessary like monthly stipend, boarding, lodging and transport facility.

Item No.	Description	Unit of Measurement
SP-715	Employing Trainee Engineer's With Boarding, Lodging And Messing	Man-Month



**ISLAMIC REPUBLIC OF PAKISTAN  
NATIONAL HIGHWAY AUTHORITY**



**OCB/CAREC/T-III:**

**Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 KM) from Two-Lane to Four-Lane Under one Package Comprising of Four Lots**

➤ *Lot-2: Jampur – DG Khan Section (64.0 Km)*

**PARTICULAR SPECIFICATION/  
SPECIAL PROVISIONS**



# Particular Specifications



**ITEM 107 STRUCTURAL EXCAVATION AND BACKFILL**

---

**107.1 DESCRIPTION**

In line 12, add at the end:

This includes excavation below original ground and back filling with granular or select fill. All common backfilling above the level of the original ground shall be payable under Item 108.

Delete 107.2.1, 107.2.2 and replace with the following.

**107.2.1 Backfill around Structure**

Backfill around or below structure shall be made with the following material.

- a) Granular backfill / Select Fill material as specified hereunder
- b) Common backfill shall be carried out from excavated material or any other borrow material approved by the Engineer.

**107.2.2 Granular backfill/Select Fill**

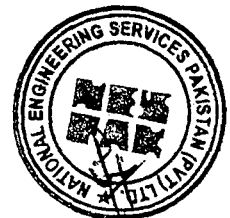
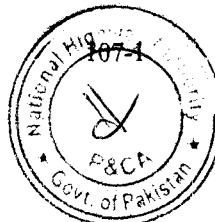
Granular backfill/Select fill material shall meet the following requirements:

a) **Grading Requirement**

mm.	inch	% passing
25	1"	100
19	¾"	60-100
4.75	No. 4	50-80
2.0	No. 10	40-70
0.425	No. 40	25-45
0.075	No. 200	0-15

Material satisfying the requirements of coarse sand falling under soil classification A-3 (AASHTO). In case, coarse sand is utilized for granular fill it shall be ensured that the same is confined properly with approved material.

- b) The material shall have a Plasticity Index of not more than six (6) as determined by AASHTO T-89 and T-90



**107.2.3 Common Backfill**

In line 3, add after "Engineer" "as per the material requirements in Section 108.2".

Add Subsection 107.2.5

**107.2.5 Requirement of Select Fill Material Below Structures' Foundations**

Requirement of Select Fill material below structures' foundations shall be as per 107.2 or as directed in writing by the Engineer.

**107.3 CONSTRUCTION REQUIREMENTS**

**107.3.1 Structural Excavation**

a) General

Delete para 3, and add the following:

"The Contractor shall notify to the Engineer well in advance about the start of any structural excavation which constitute a pay item in the Bill of Quantities. The Engineer shall observe the cross-sectional elevations and measurements taken for the existing ground in the area of the structure. Any material removed or excavated before these measurements and approved by the Engineer will not be paid.

The Contractor shall minimize, to the extent possible, the length of time that excavated areas are open. He shall be solely responsible for damages due to weather, equipment, accidents, or other causes when excavation is left open. In this regard the Contractor shall take all required precautionary measures such as barriers, barricades and warning signs etc.

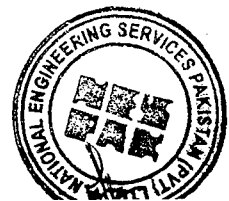
d) Preparation of Foundations of Footings

In para (ii), line 2, delete "special, care" and replace with, "special care".

At the end, add para (iii) and (iv) as follows:

iii) Foundation material on which structure is to be placed shall be compacted as per clause 107.3.3 unless otherwise directed by the Engineer.

In case unsuitable material (as per clause 108.2e) is encountered at foundation level shall be removed to the depth and extent as directed and replaced with suitable material of the type as determined by the Engineer.





iv) (a) Placement of Select Fill

All vegetation, topsoil and other unsuitable materials shall be removed. Prior to placement of the first layer of select fill, the ground surface shall be compacted as given in Section 104.2.

(b) Compaction of Select Fill

The select fill material shall be placed in layers of thickness appropriate to the type of compaction equipment and compacted to meet the following minimum requirements of compaction at OMC (-2%) to + 1 % of OMC):

- 95 % M.D.D as per AASHTO T 180 or
- 74 % Relative Density as per ASTM-D 4253/4254.

f) Pumping

Add the following in the beginning

Care shall be taken during excavation to prevent disturbance to the foundation. If ground water is encountered during excavation and a concrete seal course is not to be used, dewatering shall be commenced and shall proceed in advance of or concurrently with further excavation. The foundation shall be free of water at the time, footing concrete is placed and water control shall continue as necessary to prevent damage to the work.

All dewatering shall be performed at the Contractor's sole expense and shall be considered as included in the contract unit price(s) for the facility being constructed. The sides of excavations shall be sloped as required by soil conditions to stabilize the sides for safe working conditions. The quantities of excavations for said sloping will not be measured for payment. The backfilling shall be done with suitable materials as approved by the Engineer, at Contractor's expense.

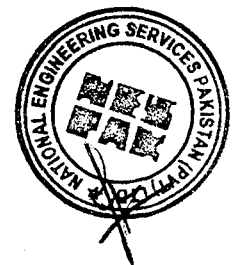
h) Classification of Excavation

Delete the whole paragraph



107.3.2 Excavation in Embankments

In para 3, line 3, delete "also" and substitute with "Also"



107.3.3 Backfill

Add the following para at the end:

Any temporary backfill or platform constructed by the Contractor for piling purposes or any other work item(s), its preparation, construction and removal

of this work by the Contractor shall not be measured for payment. Its cost shall be deemed included in the respective pay item.

**107.4 MEASUREMENT AND PAYMENT**

**107.4.1 Measurement**

a) Structural Excavation

In para 1, line 2, between "position" and "computed" insert "below top soil"

Add at the end of para (1) the following:

However the stability of the structural excavation shall be the responsibility of the Contractor for which he may use any appropriate means including shoring and / or excavation along a suitable slope line without any extra payment.

In para 3, sub-para (1), add at the end:

"Neat lines of footings or foundations shall mean the outer faces of footings or foundations excluding lean concrete.

After para 4, at the end, add the following para:

"No separate payment shall be made for compaction of excavated foundation under structures".



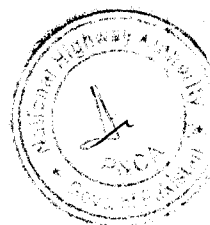
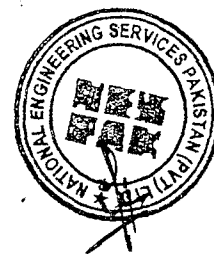
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## ITEM 108 FORMATION OF EMBANKMENT

---

### 108.1 DESCRIPTION

Add at the end of para.

The work shall also include the compaction, trimming and shaping of the side slopes as shown on the plans and removal of any excess fill as directed by the Engineer prior to placement of top soil on slopes of the embankment where required.

### 108.2 MATERIAL REQUIREMENTS

Add the following at the end of 1<sup>st</sup> para.

Wet excavated material which will be suitable when dry and if approved by the Engineer shall first be allowed to dry before being placed in the embankment. If the Contractor wishes to replace the wet (suitable) material with dry material that can be easily compacted to the required density to save his time, the same shall be done at no extra cost to the employer.

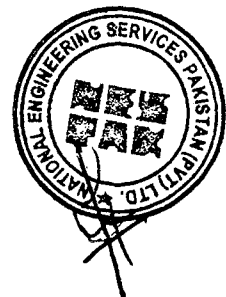
b) Delete and replace with following table;

CBR of the material with regard to depth of embankment shall be as follows

Depth of Embankment	CBR at 95% MDD
0 – 30 cm	25%
Below 30 cm	7%

Add after (d)

- e) In case non-cohesive material is used for embankment formation, it shall be properly confined at no extra cost, with a cohesive material having Liquid Limit not more than 25 and Plasticity Index not more than 6 or as approved by the Engineer.
- f) For the purpose of embankment and subgrade construction the following shall be considered as unsuitable materials:
- 1) AASHTO soil classification group of A6 and A7;
  - 2) Material from swamps, marshes and bogs;
  - 3) Peat, logs, stumps, garbage and perishable materials;
  - 4) Material susceptible to spontaneous combustion;
  - 5) Organic Soils, as determined by ASTM D 2487-83 or USBR Earth Manual.



- f) The moisture content of the soil at the time of compaction shall be optimum to achieve the compaction up to the specified density. The maximum dry density and optimum moisture content shall be determined from moisture density test (AASHTO T-180 Method D) performed on different type of soil to be used in the construction of the work. Optimum moisture content and the moisture range required for the soil to achieve the desired compaction shall be approved by the Engineer. The soil shall be compacted at optimum moisture content with +1 % to -2 % tolerances, commensurate with the soil type, unless otherwise directed by the Engineer.

When compaction is determined by "Relative Density Test" then tolerance for moisture content shall be finalized during the compaction trial and approved by the Engineer.

### **108.3 CONSTRUCTION REQUIREMENTS**

#### **108.3.1 Formation of Embankment with Borrow Common Material**

After 1<sup>st</sup> para add following:

If suitable material is not available in the Project area, the Contractor shall blend granular material with locally available soils which are otherwise unsuitable (as per category 1 of 108.2e), to achieve a uniform blend that meets the material requirements stated above without any additional cost to the Employer. Such widely divergent materials may be mixed, sampled and tested outside the embankment limits and the mixture may be used as a proposed source of borrow material as outlined in Section 108.2. However, the Contractor will submit his method statement to the Engineer and get it approved before proceeding with the work. Approval of this method statement by the Engineer shall not relieve the Contractor of his responsibility to use the suitable material in the Works. Material for embankment, obtained and approved as provided above, shall be placed in horizontal layers of uniform thickness and in conformity with the lines, grades, sections and dimensions shown on the Drawings or as required by the Engineer. The layers of loose material other than rock shall be not more than 20 cm. thick, unless otherwise allowed by the Engineer after a trial section is prepared and approved for each material source and/or borrow area.

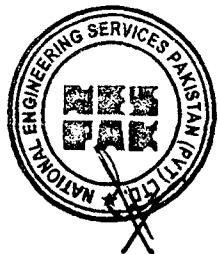
Delete para 7

Delete last para and replace it with the following:

Side slopes shall be neatly trimmed to the lines and slopes shown on the drawings or as directed by the Engineer, and the finished work shall be left in a neat and acceptable condition. The slopes of the design road cross-section shall be trimmed and compacted to the densities as specified above for different zones". No surplus material shall be permitted to be left at the toe of embankment or at the top of cut section.

#### **Relative Density Test**

For cohesion-less free-draining soils for which impact compaction will not produce a well-defined moisture density relationship curve and the maximum density, Test



for Relative density of Cohesion-less soils ASTM D-4253/4254 shall be used to determine the relative density.

Relative density is defined as the state of compactness of a soil with respect to the loosest and densest state at which it can be placed by the laboratory procedures described in the ASTM D-4253/4254. The field Density and actual Moisture Content of the compacted embankment shall be determined by field tests according to AASHTO T 191.

### 108.3.5 Formation of Embankment in Water Logged Areas

Delete 1<sup>st</sup> and 2<sup>nd</sup> paras and replace with the following:

In places where excessive moisture is encountered in natural ground and movement of heavy machinery is not possible as it creates soft spots and movement in ground, all such areas shall be left undisturbed for such period that the top surface dries up and forms a crust. The Contractor shall prepare a moisture profile up to a depth of 1.5 meters.

A blanket layer of 60 cm or more (up to one (01) meter) shall be placed in two lifts in the following manner:

- Material stocked at one end of the subject area.
- The material is than pushed by dozer making a lift of 30 cm.( or half the thickness of total lift)
- The dozer should only move on the spread material making sure that no machinery shall move on natural ground.
- After completing one stretch, the area is proof rolled. Material for 2<sup>nd</sup> lift is again stocked at one end and pushed by dozer in the similar manner as 1<sup>st</sup> lift.
- After completing the 2<sup>nd</sup> lift, the top 15 cm is compacted to 90% of maximum dry density.
- Vibration of roller shall not be allowed on blanket layer in any case.
- After approval of this layer, further filling shall be carried out as per standard procedure of 15 cm compacted layer.

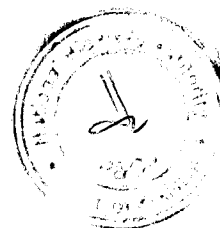
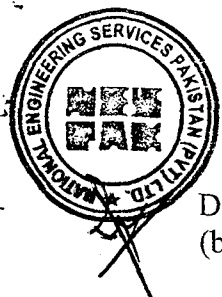
The material of blanket layer/working platform shall be as per clause 108.2 (d) and paid under item 108 c.

It should also be checked that selected grading is such that intrusion into the blanket/working platform material of sub-grade or natural ground surface material is not allowed.

For this condition to be met it will be required that the ratio as below shall be checked and followed:

$$\frac{\text{D15 - (Granular Fill Material)}}{\text{D85 - (Natural Ground Material)}} < 5$$

D15 and D85 mean the particle diameters corresponding to 15% and 85% respectively, passing (by weight) in a grain size analysis.



At the end of clause 108.3.5 add the following:

When the roadway profile is so low that after construction of the lower part of the embankment using a "bridging lift" will not permit the placement and compaction of fifty (50) centimeters of acceptable embankment material, Contractor shall prepare a proposal to raise profile of the embankment and submit it to the Engineer for his approval.

Boulders and rock fragments larger than twenty (20) centimeters in maximum dimension shall not be placed in the embankment any closer than fifty (50) centimeters from top of the subgrade.

Embankment settlement period for critical section, where height is greater than 5.0 meter, is approximately three (3) months. Embankment therefore, shall remain in place for the required settlement period before placing the 30 cm thick subgrade layer.

### **108.3.6 General Requirements**

At the end add the following:

Embankment filling shall be brought up and compacted over the full width of the embankment of the carriageways in one operation in layers parallel with the sub-grade level. At no time shall any part of the embankment width under one carriageway be left more than one layer lower than any other part of the embankment width.

Shoulder construction shall be brought up simultaneously with the pavement construction. In order to prevent water penetration into the pavement layers during construction, shoulder and median construction shall be brought up simultaneously with the pavement construction.

Embankment side slopes shall be neatly trimmed to the lines and slopes shown on the drawings or as directed by the Engineer and the finished work shall be left in a neat and acceptable condition.

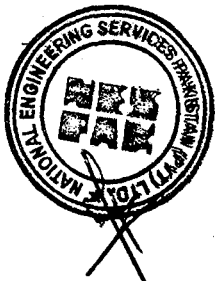
### **108.3.7 Formation of Embankment with A-3 Material**

The construction of embankments with A-3 material shall be accomplished as shown on the plans, specified in Particular Specifications and Special Provisions or as directed by the Engineer. Construction of embankment with A-3 material shall be carried out in a series of operations as follows:

Edge berms shall first be constructed along both sides of the staked embankment, except where the embankment is to be constructed against hillsides or existing embankment, using Class A-1, A-2 or A-2-4 soils from roadway excavation or borrow or any other source which can resist erosion by wind and water and are approved by the Engineer. However, if Engineer so approved A-4 material having PI value 4-8 from borrow excavation can be used for confinement. Edge berms shall be constructed with an external side slope as shown on the plans or specified in these Particular Specifications and Special Provisions, but not steeper than one (1) vertical to three (3) horizontal. Edge berms shall be constructed not more than thirty (30) centimeters in height w.r.t A-3 embankment and not less than 2.0 meters wide at the top. The materials shall be placed and spread in layers as specified in these Specifications and compacted as specified in Table 108.3.1.

### **108.3.8 Formation of Embankment on Existing Structures**

When an embankment surface is to be constructed over an area previously occupied by a building basement, cellar, irrigation canal, well, any previous excavation, or other such construction that will not permit the use of normal compaction equipment, the embankment



construction shall conform to the backfilling requirements specified in Structural Backfilling in these Specifications, until the normal compaction equipment can be used. The material shall be compacted to the density specified for the adjacent embankments.

**108.3.9 Trial Section**

Before starting the filling of the embankment, the Contractor shall construct trial sections of minimum 200 meters and maximum of 500 meters or as directed by the Engineer with each soil type / source proposed to be used as fill material. The soils used in the trials shall be the same as those intended to be used for the formation of embankment and the compacting equipment shall be the same that the Contractor will use for the main work.

The construction of embankment with any type of soil / material source shall be subject to written approval of the Engineer after the trial section made for that particular type of soil/material source.

The objective of these trials shall be to determine the optimum moisture content and the relationship between the number of passes of compacting equipment and density obtained for the soil types under trial and for the verification of the soil type itself. No separate payment will be made for this work, which shall be required as a subsidiary obligation of the Contractor under Pay Item Nos. 108a, 108b or 108c, as the case may be. The Engineer may order additional compaction test sections when deems necessary.

**108.4.1 Measurement**

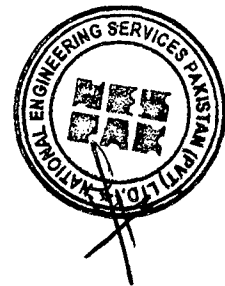
**iii) Formation from Roadway Excavation**

In para 1, last line, delete "&108b"

**108.4.2 Payment**

Replace the table as under:

Pay Item No.	Description	Units of Measurement
108a	Formation of Embankment from Roadway Excavation in Common Material	CM
108c	Formation of Embankment from Borrow Excavation in Common Material	CM
108d	Formation of Embankment from Structural Excavation	CM





## ITEM 109 SUBGRADE PREPARATIONS

---

### 109.2.3 Subgrade Preparation in Earth Cut

Delete para one and two and replace with the following:

In case bottom of subgrade level is within thirty (30) cm of the natural ground, the top  $\leq$  fifteen (15) cm material shall be removed and stockpiled at a nearby location. The exposed surface shall then be scarified, broken up, adjusted to optimum moisture content and compacted to minimum density of ninety five (95) percent of the maximum dry density as determined by AASHTO T-180 Method D. Second layer of sub-grade shall then be prepared by incorporating the above mentioned stockpiled material to ensure that the depth of sub-grade layer is thirty (30) cm.

In case, the bottom of sub-grade is below the natural ground by more than thirty (30) cm, the material above the top of sub-grade shall be removed and subsequent layer of thirty (30) cm shall be prepared in two layers as per the method describe above.

At the end add the following:

Subgrade of thirty (30) cm. shall in any case be prepared and compacted in two layers of fifteen (15) cm. each.

### 109.2.8 Protection of Completed Work

Add at the end:

It will be at discretion of the Engineer to check some or all such reaches for compaction and moisture content before placing the next layer.

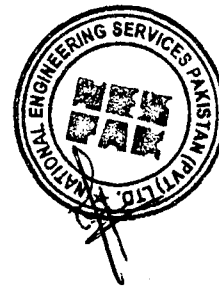
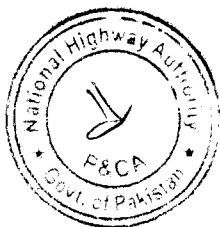
### 109.2.9 Templates and Straightedges

Delete and replace by following:

The Contractor shall provide for the use of the Engineer, satisfactory templates and straightedges in sufficient numbers to check the accuracy of the work, as provided in these specifications and no subsequent work shall be permitted until the sub-grade levels have been checked and approved by the Engineer.

### 109.2.10 Finishing Tolerances and Requirements

Quality Assurance measuring or testing shall involve verification that the sub-grade is constructed, timely finished and trimmed in a neat, workmanlike manner to the lines, grades and typical cross sections shown on the Plans or staked by the Engineer within the required tolerances.



**ITEM 201 GRANULAR SUBBASE**

**201.2 MATERIAL REQUIREMENTS**

Delete para 1 and replace it with the following:

“Material for Subbase shall consists of hard durable crushed gravel, crushed rock and crushed stone fragments and shall be cleaned and free from dirt organic matter and other deleterious substances and shall be of such nature that it can be compacted readily under water and rolling to form a firm stable subbase.”

In para (a):

Delete first sub-para including the table and replace with the following:

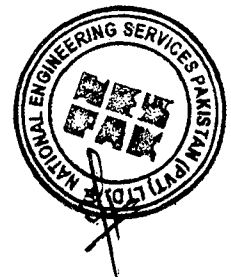
- a) The Sub-base material shall conform to gradation requirement as specified in ASTM D-2940 and given below:

Grading Requirements for Crushed Aggregate Sub-base Material		
Sieve Designation		Mass Percent Passing
mm	Inch	
50.0	2	100
37.5	1½	90-100
25.0	1	78-92
9.5	3/8	50-73
4.75	No. 4	30-60
2.00	No. 10	24-50
0.425	No. 40	13-32
0.075	No. 200	0-12

The final gradation decided within the limit designated in the table shall be all graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieves or vice versa.

Gradation requirements shall not apply on Broken Pavement Material (Asphalt layer/TST is not included) from existing road except passing at 0.075 mm sieve, being reused as Sub-base.

In para (e), line 4, delete “6” and insert “4”



## 201.3 CONSTRUCTION REQUIREMENTS

### 201.3.5 Moisture Content Determination

Delete para (b).

Same size of sample should be placed in oven for moisture determination in case of laboratory density (Proctor) and field density to ensure compatible compaction results.

Add at the end:

### 201.3.7 Protection of Completed Work

Any part of the sub-base that has been completed shall be protected and kept well drained. Any damage resulting from carelessness of the Contractor shall be repaired as directed by the Engineer without additional payment.

The Contractor shall be responsible for all the consequences of traffic being allowed to ply on the sub-base. He shall repair any ruts or ridges occasioned by his own traffic or that of others by reshaping and compacting with rollers of the size and type necessary for such repair. He shall limit the area of sub-base preparation to an area easily maintained with the equipment available. Sub-base preparation and placing of aggregate base course shall be arranged to follow each other closely. The sub-base, when prepared too soon in relation to the placing of the aggregate base course, is liable to deteriorate, and in such case the Contractor shall, without additional payment, repair, reroll, or re-compact the sub-base as may be necessary to restore it to the state specified herein.

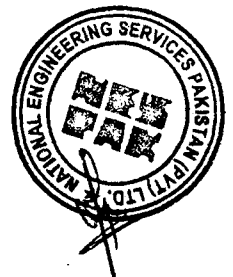
It will be at discretion of the Engineer to check some or all such reaches for compaction, moisture content and surface irregularities before placing the next layer.

## 201.4 MEASUREMENT AND PAYMENT

### 201.4.2 Payment

Replace the table of Pay Items by the following:

Pay Item No.	Description	Unit of Measurement
201a	Granular Sub-base (Crushed Aggregate)	CM
201b	Re-use of Broken / Salvaged Granular Material from existing road as Sub-base	CM



## ITEM 202 AGGREGATE BASE COURSE

### 2.2.2 MATERIAL REQUIREMENTS

Delete this Section completely and replace as follows:

Material for crushed aggregate base course shall consist of crushed hard durable gravel, rock or stone fragments. It shall be clean and free from organic matters, lumps of clay and other deleterious substances. The material shall be of such a nature that it can be compacted readily under watering and rolling to form a firm and stable base for both flexible and rigid pavements.

The aggregate base shall comply with the following grading and quality requirements.

- a) The gradation curve of the material shall be smooth, well graded and within the specified allowable tolerances and the envelope.

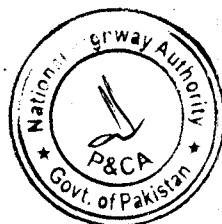
The grading table as per ASTM D 2940 given below:

Grading Requirements for Crushed Aggregate Base Material		
Sieve Designation		Mass Percent Passing Grading
mm	Inch	
50.0	(2)	100
37.5	(1.5)	95-100
19.0	(3/4)	70-92
9.5	(3/8)	50-70
4.75	No. 4	35-55
0.600	No. 30	12-25
0.075	No. 200	0-8

The final gradation decided within the limit designated in the table shall be all graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieves or vice versa.

This material shall be obtained by mechanically crushing the material retained on 3" size sieve.

The material shall be well graded so that the coefficient of Uniformity



D60/D10 shall be greater than four (4).

- b) The material passing the 19 mm sieve shall have a CBR value of minimum eighty (80) percent, tested according to the AASHTO T-193 / ASTM D-1883. The CBR value shall be obtained at the maximum dry density determined according to AASHTO T 180, Method D.
- c) The Coarse aggregate shall have a percentage of wear by the Loss Angeles Abrasion test (AASHTO T-96) of not more than forty percent (40%).
- d) The fraction passing the No. 200 sieve shall not be greater than two third of the fraction passing the 0.425 mm (No 40) sieve.
- e) The portion of filler, including any blended material, passing No. 40 mesh sieve shall have a liquid limit not more than 25 and a plasticity index not more than 6 as per AASHTO T 89 & T 90
- f) The sand equivalent determined according to AASHTO T-176 shall not be less than 45.
- g) Crushed Aggregate (material retained on sieve No. 4) shall consist of material of which hundred (100) percent by weight shall be crushed particles having a minimum one fractured face and at least ninety (90) percent by weight shall be crushed particles, having a minimum of two (2) fractured faces.
- h) The material shall have a loss of less than twelve (12) percent when subjected to five cycles of the Sodium Sulphate Soundness test according to AASHTO T-104.
- i) Flat, elongated, soft and disintegrated pieces shall not exceed 10 % of total volume of Crushed Aggregate Base Course.
- j) Friable particles tested according to AASHTO T-112 shall not exceed 0.25 %.

#### 202.2.1 Filler for Blending

In the table change Plasticity Index value from "6 maximum" to "4 maximum" and Sand Equivalent value from "30 minimum" to "45 minimum"

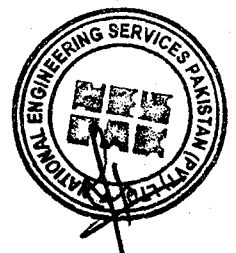
#### 202.3 CONSTRUCTION REQUIREMENTS

Delete this Section completely and replace as follows:

##### 202.3.1 Mixing of Aggregate Material

Mixing of different sizes of aggregate and stone dust shall be mixed in the central mixing plant/pug-mill at proper moisture content. Mixing at site or over prepared sub-base shall not be allowed in any case.

It shall be mandatory for the Contractor to lay aggregate base course in specified



thickness, line and grade on approved surface using mechanical paver. Dumping the aggregate base material on prepared sub-base and spreading with motor grader will not be allowed. The paver shall be power propelled unit, provided with automatically controlled screeds and feed controls capable of spreading the aggregates and maintaining specified thickness and grade. The paver shall be equipped with receiving hoppers having sufficient capacity for a uniform paving operation. The paver shall be operated at a constant speed to give best results. The mechanical paver has to be approved by the Engineer's Representative prior to start of paving activity.

**202.3.2 Preparation of Surface for Crushed Aggregate Base Course**

In case crushed aggregate base is to be laid over approved sub-base course, the sub-base course shall not have loose material or dried / over moist condition w.r.t optimum moisture content.

**202.3.3 Compaction Process**

Compaction process shall conform in all respect to the requirements specified under this heading in Item 201 (201.3.3).

**202.3.4 Compaction Requirement**

The relative compaction of each layer of the compacted base shall not be less than 100 percent of the maximum dry density determined according to AASHTO T-180, Method D after adjustment of coarse particles obtained during field density test (retained on 19 mm sieve or 4.75 mm sieve whichever is applicable) as per AASHTO Method T-224. The field density shall be determined according to AASHTO T-191.

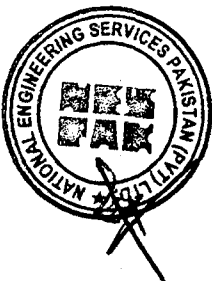
Completed base course shall be maintained in an acceptable condition at all times until prime coat is applied. When base course is to carry traffic for an indefinite length of time before receiving surfacing, the Contractor shall maintain the surface until final acceptance and shall prevent reveling by wetting, blading, rolling and addition of fines as may be required to keep the base tightly bound and leave a slight excess of material over the entire surface which must be removed and the surface finish restored before application of prime coat.

**202.3.5 Moisture Content Determination**

Moisture content determination shall conform in all respects to the requirements specified under clause 201.3.5 for sub-base.

**202.3.6 Trial Sections**

Prior to commencement of crushed aggregate base course operations, a trial section of two hundred (200) meters minimum, but not to exceed five hundred (500) meters shall be prepared by the Contractor using same material and equipment as will be used at site to determine the adequacy of equipment, loose depth measurement necessary to result in the specified compacted layer depths,



field moisture content, and relationship between the number of compaction passes and the resulting density of material.

### **202.3.7 Surface Tolerance**

Grade control shall be accomplished by means of grade stakes, steel pins or forms, placed in lanes parallel to the centerline of the road and at intervals sufficiently close to permit placing of string lines or straightedges for checking purposes.

The surface layer of the crushed aggregate base course shall be evaluated for compliance with the following surface tolerances:

- a) The cross section of the finished aggregate base surface shall be checked by the Contractor in the presence of the Engineer at maximum intervals of twenty-five (25) meters and at intermediate points as directed by the Engineer.
- b) The allowable tolerances in design elevation of the finished base are stated in "Table for Allowable Tolerances" in these Specifications.

Isolated deviations below the design elevation shall be compensated by additional thickness of the subsequent pavement layer. Additional cost and materials resulting from deviations from the design elevation shall be borne by the Contractor.

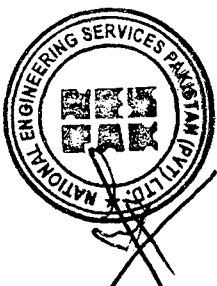
### **202.3.8 Acceptance, Sampling and Testing**

Acceptance of sampling and testing with respect to materials and construction requirements shall be governed by the relevant, "Table for Sampling and Testing Frequency" or as approved by the Engineer.

### **202.3.9 Protection of Completed Work**

Any part of the aggregate base course that has been completed shall be protected and kept well drained. Any damage resulting from carelessness of the Contractor shall be repaired as directed by the Engineer without additional payment.

The Contractor shall be responsible for all the consequences of traffic being allowed to ply on the aggregate base course. He shall repair any ruts or ridges occasioned by his own traffic or that of others by reshaping and compacting with rollers of the size and type necessary for such repair. He shall limit the area of aggregate base course preparation to an area easily maintained with the equipment available. Aggregate base course preparation and placing of asphalt base course shall be arranged to follow each other closely. The aggregate base course, when prepared too soon in relation to the placing of the asphalt base course, is liable to deteriorate, and in such case the Contractor shall, without additional payment, repair, reroll, or re-compact the aggregate base course as may be necessary to restore it to the state specified herein.

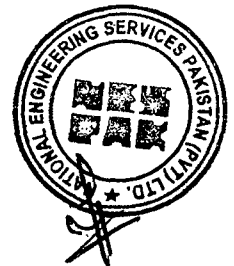
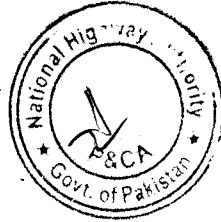


It will be at discretion of the Engineer to check some or all such reaches for compaction, moisture content and surface irregularities before placing the next layer.

**202.4.2 Payment**

Replace the pay Item table as follows:

<b>Pay Item No.</b>	<b>Description</b>	<b>Unit of Measurement</b>
202	Aggregate Base Course (Mixing in Central mixing Plant/ Pugmill and Laid with Mechanical paver)	CM





**ITEM 203 ASPHALTIC BASE COURSE (HOT PLANT MIX)**

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Delete the entire item and replace it by the following:

**203.1 DESCRIPTION**

This work shall consist of furnishing plant, labor, equipment, materials, mixing aggregates and asphalt binder and additive material (where required) at a central batch asphalt mixing plant, to a specified temperature, hauling, including loading unloading, laying and compacting the mixture on an approved primed sub-grade, sub-base or base course in accordance with these Specifications and in conformity with the lines grades and typical cross-sections shown in the Drawings or as directed by the Engineer.

**203.2 MATERIAL REQUIREMENTS**

**203.2.1 Mineral Aggregate**

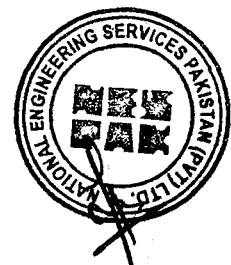
Mineral aggregate for bituminous base course shall consist of coarse aggregate, fine aggregate and filler material, if required, all conforming to the following requirements:

Coarse aggregate which is the material retained on AASHTO No. 4 sieve shall consist of crushed rock, crushed gravel or crushed boulder. It shall be clean, hard, tough, sound, durable, and free from decomposed stones, organic matter, shale, clay lump or other deleterious substances. Rock or boulders, from which coarse aggregate is obtained, shall be of uniform quality throughout the quarry.

The crushing shall be so regulated that (material retained on sieve # 4) shall have all faces crushed without any uncrushed surface. The type of source shall be uniform throughout the quarry location from where such a material is obtained. Rock to be crushed for use as bituminous concrete aggregate, shall be screened in such a manner that all material to be crushed is retained on a 75 mm (3") screen.

Fine aggregate which is material passing No. 4 sieve, shall consist of 100% crushed material from rock and shall be stored separately. No natural sand will be allowed in the mix.

When the combined grading of the coarse and fine aggregates is deficient in material passing No. 200 sieve, additional filler material shall be added. The filler material shall consist of finely divided rock dust, including dust from plant collection system, hydrated lime, hydrated cement or other suitable mineral matters free of deleterious material conforming to the requirements of AASHTO M-17. However, in case the coarse aggregates are of quartzitic nature, then hydrated lime or a better material shall be required. At the time of use, it shall be sufficiently dry to flow freely. Filler material shall conform to following gradation:

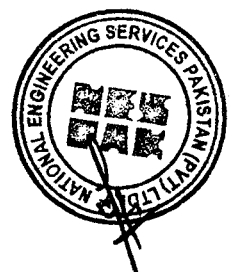


US Standard Sieve	Percent Passing by Weight
No. 30	100
No. 50	95 – 100
No. 200	70 – 100

The ratio of filler to binder should range from 1.0-1.5.

The coarse and fine aggregates shall meet the following requirements:

- a) The coarse aggregate shall have a percentage of wear by the Los Angeles Abrasion test (AASHTO T-96) not more than forty (40).
- b) The coarse and fine aggregates shall have a Specific Gravity value of not less than 2.60 and value for absorption of water not more than 2% as determined by AASHTO T 84 and T 85.
- c) The material shall have a loss of less than twelve (12) percent when subjected to five cycles of the Sodium Sulphate Soundness test according to (AASHTO T-104).
- d) The Sand Equivalent (AASHTO T 176) determined after all processing except for addition of asphalt cement shall not be less than forty five (45).
- e) The fine fraction of the material shall have a liquid limit not more than twenty five (25) and a Plasticity Index (as determined by AASHTO T-89 and T-90) not more than four (4). The plasticity index of mineral filler should not be more than four (4).
- f) The portion of aggregate retained on the 9.5 mm (3/8 inch) sieve shall not contain more than fifteen (15) percent by weight of flat and/or elongated particles as determined in accordance with ASTM D 4791, standard test method for flat and/or elongated pieces (ratio of maximum to minimum dimension = 3:1).
- g) The coarse aggregate when tested by the Coating and Stripping Test (AASHTO T-182) shall have a coated area above ninety five (95) percent.
- h) Petrographic examination of the coarse aggregate is mandatory for the approval of source. The coarse aggregates shall be checked for cationic and anionic behavior so that their affinity with the bitumen to be used is verified.



### 203.2.2 Asphalt Material

Asphalt binder for asphalt base course shall be asphalt cement 60-70 penetration grade, conforming to the requirement in Table 301-2 of Item Asphaltic Materials in these Specifications.

When asphalt cement 60-70 penetration grade is used, the optimum ratio between bituminous material and filler shall be so determined that the bituminous filler mixture will reach its softening point, not less than eighty (80) degree centigrade when tested in accordance with AASHTO T 53

### 203.2.3 Asphalt Base/Leveling Course Mixture

The composition of the asphalt base/leveling course mixtures for base course shall conform to classes shown in the following table:

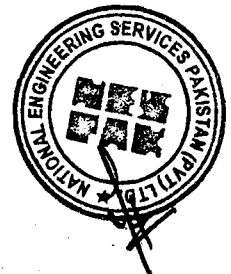
**Table 203-1**

#### **Combined Aggregate Grading Requirements**

<b>Mix Designation</b>	<b>Class-A</b>	<b>Class-B</b>
Use	Leveling/Base	Leveling/Base
Compacted Thickness	75-100 mm	75-100 mm
<i>U.S. Standard Sieve Size</i>	<i>Percent passing by weight</i>	
1½" (38 mm)	100	100
1" (25 mm)	75-90	90-100
¾" (19 mm)	65-80	-
½" (12.5 mm)	55-70	56-80
⅜" (9.5 mm)	45-60	-
No. 4 (4.75 mm)	30-45	29-59
No. 8 (2.38 mm)	15-35	19-45
No. 50 (0.300 mm)	5-15	5-17
No. 200 (0.075 mm)	2-7	1-7
Asphalt Content by weight of mix (%)	3 (Minimum)	

Class-B shall be used for Asphaltic Base / Levelling course unless specified otherwise by the Engineer. The grading limits specified are based on materials of uniform specific gravity and shall be adjusted by the Engineer to compensate any variation in specific gravity of individual sizes. The grading may be varied by the Engineer on the basis of Marshall Tests to obtained optimum stability and life of completed asphalt pavement. Grading limits determined by Fuller Equation (MS - 2) should be avoided.

The asphalt leveling/base course mixture shall meet the following Marshall Test Criteria:



Compaction, number of blows to each end of specimen

Stability (30 minutes/60 °C)	75 1,000 kg (Min.)
Flow, 0.25 mm (0.01 in.)	8-14 (2 – 3.5)
Percent air voids in mix	4-6
Percent voids in mineral aggregates	According to table 5.3 MS-2, Asphalt Institute sixth edition or the latest edition
Percent voids filled with asphalt	50-65
Loss of Marshall Stability	25 percent (max.)

#### 203.2.4 Job-Mix Formula

At least eight (8) weeks prior to commencement of asphalt, the Contractor shall start the tests for the design of JMF for the asphalt base course production for the Project. At least one week prior to production, a JMF for the asphalt mix to be used shall be established jointly by the Contractor and the Engineer meeting Project Specification requirements.

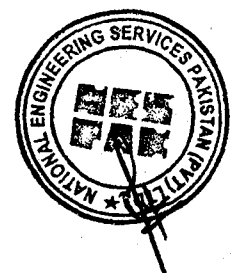
The JMF shall be established by Modified Marshall Method of Mix Design for Large Aggregate according to the procedure prescribed in the Asphalt Institute Manual Series No. 2 (MS-2), Sixth Edition, taking into account following recommendations.

The JMF, with the allowable tolerances shall be within the range specified in Item 203.2.3 and herein. Each JMF shall indicate a single percentage of aggregate passing each required sieve size and a single percentage of bitumen to be added to the aggregate.

Marshall mixing temperature shall be one hundred and sixty plus/minus five ( $160 \pm 5$ ) degree centigrade at which heated asphalt produces a kinematic viscosity one hundred and seventy  $\pm$  twenty ( $170 \pm 20$ ) centistokes.

Marshall compacting temperature shall be one hundred and forty five plus/minus five ( $145 \pm 5$ ) degree centigrade at which heated asphalt produces a kinematic viscosity of two hundred and eighty plus/minus thirty ( $280 \pm 30$ ) centistokes.

The combined gradation should produce a smooth curve within the master grading band for designated mix. The job-mix formula with allowable tolerances for a single test then becomes the job control grading band. If application of job-mix



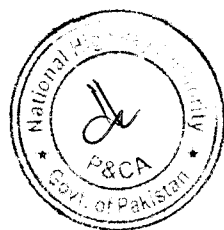
tolerances results in a job control grading band outside the master grading band, the full tolerances shall still apply. The asphalt content thus determined shall be used to check for compliance for stability, flow and voids filled, etc. as per the specifications. Minimum coating of bitumen film on aggregate should be 8 micron.

### METHODOLOGY FOR MODIFIED MARSHAL METHOD

Mixes composed of larger size aggregates with maximum size up to 38 mm (1.5 inches) will be prepared according to modified Marshall Method as per MS-2 Asphalt institute, sixth edition, 1993 or the latest edition. The procedure is basically the same as the original method except for following differences that are due to the larger specimen size that is used:

- a) The hammer weighs 10.2 kg (22.5 lb.) and has a 149.4 mm (5.88 inches) flat tamping face. Only mechanically-operated device is used for the same 457 mm (18 inches) drop height.
- b) The specimen has a 152.4 mm (6 inches) diameter by, 95.2 mm (3.75 inches) height.
- c) The batch weights are typically of 4 Kg.
- d) The equipment for compacting and testing (molds and breaking heads) are proportionately larger to accommodate the larger specimens.
- e) The mix is placed in the mold in two approximately equal increments, with spading performed after each increment to avoid honey-combing.
- f) The number of blows needed for the larger specimen is 1.5 times (75 or 112 blows) of that required for the smaller specimen (50 or 75 blows) to obtain equivalent compaction.
- g) The design criteria shall be modified as well, the minimum stability shall be 2.25 times and the range of flow values shall be 1.5 times normal-sized specimens.
- h) Similar to the normal procedure, following values shall be used to convert the measured stability values to an equivalent value for a specimen with a 95.2 mm (3.75 inches) thickness, if the actual thickness varies:

Approximate Height mm (inches)	Specimen Volume (Cubic cm)	Correlation Ratio
88.9 (3 1/2)	1608 to 1626	1.12
90.5 (3 9/16)	1637 to 1665	1.09
92.1 (3 5/8)	1666 to 1694	1.06
93.7 (3 11/16)	1695 to 1723	1.03
95.2 (3 3/4)	1724 to 1752	1.00
96.8 (3 13/16)	1753 to 1781	0.97
98.4 (3 7/8)	1782 to 1810	0.95
100.0 (3 15/16)	1811 to 1839	0.92
101.6 (4)	1840 to 1968.	0.90



Prior to final approval, the proposed job mix, with a Asphalt content at the permissible upper percentage limit determined in JMF, shall be compacted to refusal density (when density does not increase with additional compaction efforts or breakage of stones start) such that the resulting air voids in the mix shall not be less than 3%.

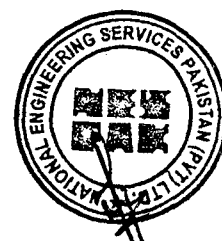
Once JMF is established, all mixtures furnished for the project represented by samples taken from the asphalt plant during operation, shall conform thereto. Moreover upon receiving the job-mix, approved by the Engineer, the Contractor shall adjust his plant to proportion the individual aggregates, mineral filler and asphalt to produce a final mix that when compared to job mix formula shall be within the following limits.

**Maximum Variation of Percentage of Materials**

Retained No. 4 and larger	± 7.0 %
Passing No. 4 to No. 100 sieve	± 4.0 %
Passing No. 200	± 1.0 %
Asphalt Content (weight % of total mixture)	-0.2% to +0.2 %

In addition to meeting the requirements specified in the preceding items, the mixture as established by the JMF shall also satisfy the following physical properties:

- a) Loss of Marshall Stability by immersion of specimen in water at sixty (60) degree centigrade for 24 hours as compared with stability measured after immersion in water at sixty (60) degrees centigrade for twenty (20) minutes shall not exceeds twenty five (25) percent. If the mixture fails to meet this criterion, the JMF shall be modified.
- b) In case mix fails to meet the stripping test requirement then anti-stripping agent shall be used for which no separate payment shall be made.
- c) Should a change of source of materials be made, a new JMF shall be established before the new material is used. When unsatisfactory results or other conditions make it necessary, a new Job Mix Formula will be required.
- d) The assistance of the Engineer in the preparation of the job standard mix in no way relieves the Contractor of the responsibility of producing an Asphalt mix meeting the requirements of the Specifications.
- e) The density of the compacted mixes shall be related to the daily Marshall Density which shall be determined by making three standard Marshall Specimens from samples of the mix taken from behind the paver. The density of each sample shall be determined and compared with the mean value. Any individual result which varies from the mean by more than 0.015 gm/cc shall be rejected. Marshall Test shall be repeated on a daily basis to establish the



- f) Daily Marshall Density for that particular day's work or one sample of 500T production. The daily Marshall Density shall not vary from the Job Mix Design Density by more than  $\pm 1.0\%$ . Loss of stability shall be tested on other three Marshall Specimens from samples of the mix taken from behind the paver.
- g) The compliance criteria contained in the Job Mix Tolerances provide an indication of the maximum acceptable value of the standard deviation for each parameter. If asphalt mix shows variation in excess of these limits, the source of variation shall be determined by the Contractor and rectified by him to the satisfaction of Project Specifications and Engineer. If the excessive variations continue, the Engineer shall order stoppage of production and laying for the Works, until the Contractor has demonstrated his ability to re-establish acceptable control.

### 203.2.5 Asphalt Additives

Hydrated lime or any other additive may be used as an anti-stripping agent as and when required. When used, hydrated lime shall be added at a rate between 1% and 2% by weight of the total mix with the aim of eliminating stripping tendencies. Hydrated lime shall be fed by a separated feeding system into pug mill for each batch. Percentage of additive and relative specifications for any other type of additives shall be based on manufacturer's specifications for the product, subject to approval of the Engineer.

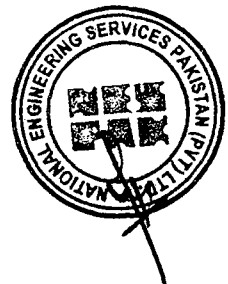
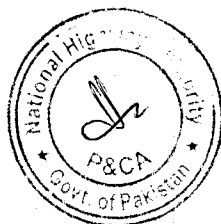
No additional cost shall be paid for use of hydrated lime or any other anti-stripping additive, and payment shall be deemed to be included in the respective pay items of asphaltic base course.

## 203.3 CONSTRUCTION REQUIREMENTS

### 203.3.1 Asphalt Mixing Plant

Mixing plants used for the preparation of Asphalt Mixtures shall be batch plants conforming to AASHTO M-156, and of adequate capacity, coordinated and operated to produce a mixture within the limits of specifications. Plant shall have minimum three cold bins and at least 3<sup>1/2</sup> decks of hot sieves to effectively control the gradation of hot bins. It should be provided with facilities necessary for protection of environment such as dust control facility. Special emphasis shall be given to the following considerations:

- A large bucket to handle a batch in a single weighing.
- The mixer box shall be equipped with a dust hood to prevent loss of dust by dispersion.
- A mechanical batch counter shall be installed as part of the timing device and shall be designated to register only completely mixed batches.



- The plant shall be fully computerized batch-plant.
- The automatic proportioning system shall be capable of consistently delivering materials within the full range of batch sizes within the following tolerances:

Description	Total Batch Weight of Paving Mix %
Batch aggregate component	±1.5
Mineral filler	±0.5
Bituminous material	±0.1
Zero return (aggregate)	±0.5
Zero return (bituminous material)	±0.1

An automatic graphic or digital record shall be produced for each batch of bituminous concrete indicating the proportions of each aggregate component, mineral filler, and bituminous material. Such records of the batches shall be further identified through a print of day and date. Bituminous material proportions shall be recorded either as weight or volume.

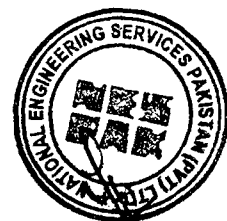
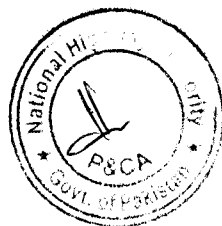
### 203.3.2 Preparation of Aggregates

Before being fed to the dryer, aggregates for the asphalt base courses shall be separated into three or more sizes and stored separately in cold bins. One bin shall contain aggregate of such size that eighty (80) percent will pass sieve No. 4, and the other two bins shall contain aggregate of such sizes that eighty (80) percent will be retained on sieve No. 4. Should fine material, be incorporated in the mix, a separate bin shall be provided in addition to the three bins mentioned above. If filler is used as a separate component it will also be stored and measured separately and accurately before being fed into the mixer through filler screw mechanism.

Each aggregate ingredient shall be heated and dried at a temperature not to exceed one hundred and seventy (170) degree centigrade. If aggregates contain sufficient moisture to cause foaming in the mixture or their temperature is in excess of one hundred and seventy (170) degree centigrade they shall be removed from the bins and returned to their respective stock piles. Immediately after heating, the aggregates shall be screened to required sizes and stored in separate bins for batching and mixing with Asphalt material

In placing the materials in bins or in moving those from bins to the mixer, any method which causes segregation or uncontrolled combination of material of different grading shall be discontinued.

Asphalt cement shall be heated within a temperature range of hundred and thirty





five to hundred and sixty three (135-163) degrees centigrade at the time of mixing. Asphalt cement heated above maximum shown shall be considered overheated and shall be rejected and removed from job site.

Dried aggregate weighed and drawn to pug-mill shall be combined with proportionate quantity of asphalt cement according to the job mix formula. Temperature of asphalt, except for temporary fluctuations, shall not be lower than fifteen (15) degree centigrade below the temperature of the aggregate, at the time; the two materials enter into the pug-mill. In no case shall the temperature of an asphalt mix exceed one hundred and sixty five (165) degree centigrade when discharged from the pug-mill.

### 203.3.3 Hauling Equipment

Dump truck used for hauling bituminous mixtures shall have tight, clean, smooth metal beds which have been thinly coated with an approved material to prevent adhering of material to the beds. Each truck shall have a cover of canvas or of other suitable material of sufficient size as to protect the mixture from the weather. The mixture will be delivered on the road at a temperature not less than hundred and forty five plus/minus five ( $145 \pm 5$ ) degree C. Drivers of dump trucks will ensure that while reversing the vehicles, paver is not pushed back producing a hump.

### 203.3.4 Bituminous Pavers

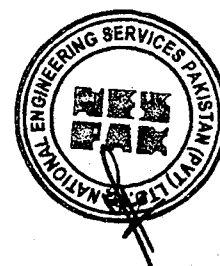
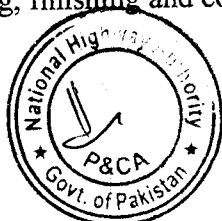
Bituminous pavers shall be self-contained, power-propelled units, provided with an automatically controlled activated screed or strike-off assembly, heated if necessary, capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and thickness shown on the plans. Pavers used for shoulders and similar construction shall be capable of spreading and finishing course of bituminous plant mix material in widths shown on the plans.

The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The paver shall be equipped with automatic feed controls, properly adjusted to maintain a uniform depth of material ahead of the screed.

The screed or strike-off assembly shall be capable of producing a finished surface of the required evenness and texture without tearing, shoving or gouging the mixture.

When laying the mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture. The paver shall be operated at speeds which will give the best result for the type of power being used.

The mixed material shall be delivered to paver in time to permit completion of spreading, finishing and compaction of mixture during day light hours.



The paver shall be equipped with automatic screed controls with sensors for either or both sides of the paver, capable of sensing grade from an outside reference line, sensing the transverse slope of the screed and providing the automatic signals which operate the screed to maintain the desired grade and transverse slope. The sensor shall be so constructed that it will operate from a reference line or a ski-like arrangement.

The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent variation.

Manual operation will only be permitted in the construction of irregularly shaped and minor areas.

Whenever a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods in order to allow the contractor to use the asphalt already produced at the plant or in transit, provided this method of operation will produce results otherwise meeting the specifications.

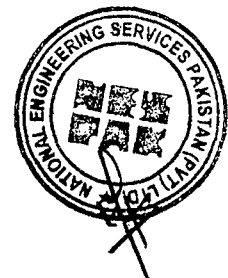
Reference lines will be required for both outer edges of the traveled way for each main line roadway for vertical control. Horizontal control utilizing the reference line will be permitted. The grade and slope for intermediate lanes shall be controlled automatically from reference lines or by means of a ski and a slope control device or a dual ski arrangement. When the finish of the grade prepared for paving is superior to the established tolerance and, when in the opinion of the Engineer, further improvement to the line, grade, cross sections and smoothness can best be achieved without the use of the reference line; a ski-like arrangement may be substituted subject to the approval of the Engineer. The use of the reference lines shall be reinstated immediately whenever the Contractor fails to maintain a superior pavement. The Contractor shall furnish and install all pins, brackets, tensioning devices, wire and accessories necessary for satisfactory operation of the automatic control equipment.

### 203.3.5 Rollers

Rollers shall be steel wheel, pneumatic tyre and vibratory, or a combination thereof. The roller(s) shall be in good condition, capable of reversing without backlash, and shall be operated at speeds slow enough to avoid displacement of the bituminous mixture. The number and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. Vibratory rollers shall be acceptable for bituminous mixture compaction. The use of equipment, which results in excessive crushing of the aggregate, will not be permitted.

### 203.3.6 Preparation of Base or Existing Pavement Surface

Before spreading materials, the surface of base or existing pavement on which the mix is to be placed shall be conditioned by application of a prime or tack coat as specified.



After a prime coat is applied, it shall be left undisturbed not less than forty eight (48) hours. The Contractor shall maintain the primed surface until the mix material has been placed. This maintenance shall include the spreading of sand or other approved material, if necessary to prevent adherence of the prime coat to the tyres of vehicles using the primed surface, and patching any breaks in the primed surface with additional bituminous material. Any area of primed surface that has become damaged shall be repaired before the mix is placed, to the satisfaction of Engineer. It shall be ensured that primed surface is not in tacky condition, when premix is laid.

After a tack coat is applied, it shall be allowed to dry until it is in the proper condition of tackiness to receive the mix. The tack coat shall be applied only as far in advance of the placing of mix, as is necessary to obtain the proper condition of tackiness. Any breaks in the tack coat shall be repaired.

When the surface of the existing pavement or old base is irregular, it shall be brought to uniform grade and cross-section by leveling course as directed. The leveling course mixture shall conform to the requirements of Item 203.2.

A thin coating of bituminous material shall be sprayed on contact surface of curbing, gutters, manholes, and other structures, prior to the bituminous mixture being placed against them.

#### 203.3.7 Spreading and Finishing

The mixture shall be laid upon an approved surface, spread and struck off to the section and elevation established. Bituminous pavers shall be used to distribute the mixture either over the entire width or over such partial width as may be practicable.

Longitudinal joints for each course shall be offset thirty (30) centimeters from the joint in the immediate underlying course. Transverse joints shall be offset a minimum of sixty (60) centimeters from the joint of the immediate underlying course.

Longitudinal joints shall be located within fifteen (15) centimeters of the centerline of the roadway or within fifteen (15) centimeters of the centerline of a lane. Longitudinal joints shall be held to the minimum practical number. Longitudinal joints shall be formed by lapping the screed over the first layer placed, crowding a ridge of Asphalt material at the joint and crimping the ridge of material into the joint by a compaction roller while the material is hot.

Transverse joints shall be formed by cutting back the first layer placed to the full depth of the layer, removing and wasting the material, spreading new Asphalt material in sufficient quantity to create a compacted thickness equal to the thickness of the first layer. The joint shall be cross rolled with one coverage and the joint checked with a straight edge not less than four (4) meters in length. High points shall be removed and sags filled with additional Asphalt material and the joint rolled a second time. The joint shall again be checked with a straight edge,



humps and sags adjusted as necessary, and rolled until the joint is complete and compacted as specified.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture shall be spread, raked and luted by hand-tools. For such areas the mixture shall be dumped, spread and screeded to give the required compacted thickness, ensuring even distribution of coarse and fine material.

When production of the mixture can be maintained and wherever practical, pavers shall be used in echelon to place the wearing course in adjacent lanes and compacted to form a surface without lateral joint.

All mixtures shall be spread at a temperature of not less than hundred and forty five plus/minus five ( $145 \pm 5$ ) degree C and all initial rolling or tamping shall be performed when the temperature of the mixture is such that the sum of the air temperature plus the temperature of the mixture is between 165 degree C and 190 degree C. The mixture shall not be placed on any wet surface or when weather conditions will otherwise prevent its proper handling or finishing.

Asphalt concrete pavement asphalt base course shall not be placed on any wet or frozen surface, during rain, dust or sand storms, when wind or other weather conditions prevent the proper handling of the Asphalt mixtures or when atmospheric temperature is five (5) degree centigrade or less. Care should be taken during spreading operation under windy condition in winter, even if temperature is above five (5) degree centigrade.

The spreading operations should be immediately terminated if it begins to rain during the operation.

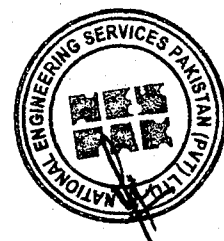
Hand laying of any Asphalt material will be permitted only in the following circumstances:

- a) For laying regulating courses of irregular shape and varying thickness;
- b) In confined spaces where it is impracticable for a paver to operate;
- c) For footways;
- d) At the approaches to expansion joints at bridges or viaducts;

### 203.3.8 Compaction

After spreading and strike off and as soon as the mix condition permits the rolling to be performed without excessive shoving or tearing, the mixture shall be thoroughly and uniformly compacted. Rolling shall not be prolonged when cracks appear on the surface.

Initial or breakdown rolling shall be done by means of either a tandem steel roller



or three wheeled steel roller. Rolling shall begin as soon as the mixture will bear the roller without undue displacement.

The number and weight of rollers shall be sufficient to obtain the required compaction while the mixture is still in workable condition. The sequence of rolling and the selection of roller types shall provide the specified pavement density. Initial rolling with a tandem steel roller or a three-wheeled steel roller shall follow the paver as closely as possible.

Unless otherwise directed, rolling shall begin at the lower side and proceed longitudinally, parallel to the road centerline, each trip overlapping one-half of the roller width, gradually progressing to the crown of the road. When paving in echelon or abutting a previously placed lane, the longitudinal joint should be rolled first followed by the regular rolling procedure. On super elevated curves the rolling shall begin at the low side and progress to the high side by overlapping of longitudinal trips parallel to the centerline. Intermediate rolling with a pneumatic tired roller shall be done behind the initial rolling. Final rolling shall eliminate marks from previous rolling. In no case shall the temperature be less than hundred and twenty (120) degree C. for initial break down rolling while all other compaction operations shall be completed before the temperature drops down to hundred and ten (110) degree C.

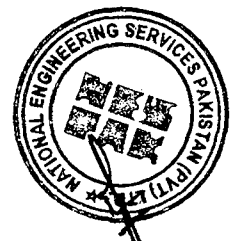
Rollers shall move at a slow but uniform speed with the drive roll or wheels nearest the paver. Rolling shall be continued until all roller marks are eliminated and a minimum density of Ninety seven (97) percent of a laboratory compacted specimen made from asphalt material obtained for daily Marshall Density is achieved.

Relevant test methods for density of bituminous concrete in place by Nuclear Methods such as ASTM D 2950 (latest version) and or other method as directed by the Engineer shall be used to establish the proper rolling effort and pattern to achieve the required density and to ensure achieving the specified percent compaction during the placement of the bituminous concrete as quality control testing. A calibration factor for the Nuclear Method must be established as per the equipment's manufacture's requirements, and at any time a change is made in the paving mixture, in construction process or after every fifteen days of asphalt production whichever is earlier. Compare the results obtained to samples compacted to Marshall Density to determine percentage of compaction.

Any displacement resulting while reversing the direction of a roller, or from other causes, shall be corrected at once by the use of rakes and addition of fresh mixture when required. Care shall be exercised in rolling not to displace the line and grade of the edges of the bituminous mixture.

To prevent adhesion of the mixture to the rollers, wheels of rollers shall be kept properly moistened with water or water mixed with very small quantities of detergent or other approved material. Excess liquid will not be permitted.

Along forms, curbs, headers, walls and other places not accessible to the roller,



the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons or with mechanical tampers. On depressed areas, tampers be used or cleated compression strips may be used under the roller to transmit compression to the depressed area.

Any mixture that becomes loose and broken, mixed with dirt, or is in any way defective in finish or density shall be removed and replaced with fresh hot mixture, which shall be compacted to conform to the surrounding area. Any area showing an excess or deficiency of bituminous material shall be removed and replaced.

Three steps of rolling are as follows:

**a) Breakdown Rolling**

Breakdown Rolling may be accomplished with static or vibratory steel-wheeled rollers. Compaction shall be carried out using rollers of approved dead weight smooth wheeled rollers or by multi-wheeled pneumatic tyred rollers of equivalent mass, or by vibratory rollers or a combination of these. Asphalt base/leveling course material shall always be surface finished with a smooth wheeled roller which may be a dead weight roller or alternatively a vibratory roller in non-vibrating mode. Vibratory rollers shall not be used in vibrating mode on bridge decks.

Vibratory rollers may only be used if they are capable of achieving at least the standard of compaction of 9-tonne dead weight roller to meet the specified percent compaction of Marshall Max. Density, and shall be equipped or provided with devices indicating the frequency at which the mechanism is operating and the speed of travel which can be read from the ground.

It is important to start the rolling operation on the low side of the mat (usually the outside of the lane being paved) and progress towards the high side. When adjoining lanes are placed, the same rolling procedure should be followed but only after compaction of the longitudinal joint.

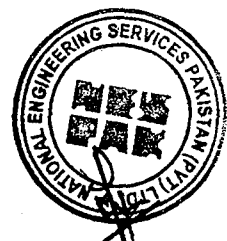
**b) Intermediate Rolling**

Intermediate rolling with pneumatic tyre rollers and should follow breakdown rolling as closely as possible, while the asphalt mix is still well above the minimum temperature at which densification can be achieved.

Intermediate rolling should be continuous until all of the mix placed has been thoroughly compacted. Regardless of the type of rollers used, the rolling pattern should be developed in the same manner as for breakdown rolling.

**c) Finish Rolling**

Finish rolling is done solely for the improvement of the surface. It should be accomplished with steel-tired, static-weight tandems or vibratory tandems without vibration while the material is still warm enough for removal of roller



marks.

The material shall be rolled in a longitudinal direction with the driven rolls nearest the paver. The roller should first compact the material adjacent to any joints and then work from the lower to the upper side of the layer overlapping on successive passes by at least half the width of the rear roll or in the case of a pneumatic tyre roller, at least the nominal width of one tyre.

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

### **203.3.9 Frequency of Testing for Cores**

One core shall be taken for each 100 linear meter of each lane of Asphalt Base, or fraction thereof, in special cases. If the core so taken fails to achieve the specified compaction (97%), then two (2) additional cores shall be taken in the longitudinal alignment of the road at an interval of three (3) meters on either side with respect to the failing core. If all the three cores give an average of 97% compaction, and the individual compaction of any core is not less than ninety five (95) percent, then the compaction shall be acceptable. If average of the three cores further fails against compaction, then two (2) additional cores shall be taken at a distance of fifteen (15) meters on either side and compaction shall be checked for all the five cores in the same fashion. If average of five cores is 97%, the area will be accepted. In case average of 5 (five) cores is ninety six percent (96%) or more, then Engineer may withhold the payment partly and observe behavior during maintenance period, for the release of full payment or otherwise. In case of failure of the average of these five cores giving average compaction of less than 96%, the failed area shall be removed and subsequently be replaced by specified mix in an approved manner at the expense of Contractor.

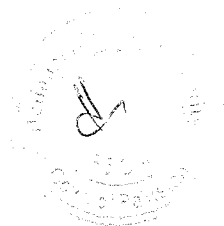
### **203.3.10 Surface Tolerances**

Surface smoothness of asphalt base/leveling course shall be measured with four (4) M straightedge by Engineer at selected locations. The variation of surface from testing edge of straightedge between any two (2) contacts shall be determined by placing it parallel and perpendicular to center line of roadway and value thus determined should not vary more than limits prescribed by "Table for Allowable Tolerances" in these Specifications.

Any irregularities that exceed the specified tolerances or that retain water on the surface shall be corrected by removing the defective area and replacing with new asphalt base course without additional cost to the Employer.

### **203.3.11 Base Thickness Tolerances**

For determination of thickness, one (1) core for each hundred (100) linear meter of each lane shall be taken. Unless otherwise permitted, cores extracted for thickness measurement shall not be used for density determination and density cores shall not be used for thickness measurements unless permitted by the



Engineer.

When layer thickness of asphaltic base course is deficient by more than five (5) mm from that specified in the Drawings, the deficiency shall be removed with satisfactory base course material and/or made up by additional asphalt concrete wearing course thickness without extra cost to the Employer. If such remedial action is authorized, revised thickness determinations shall be made by measurements of new cores taken after placing of "Asphaltic Wearing Course" material or as directed by the Engineer. If base course deficiencies are corrected in this manner, full payment for the "Asphaltic Base Course" will be made to the Contractor, but no additional payment will be made for the increase in thickness of the "Asphaltic Wearing Course".

#### **203.3.12 Acceptance Sampling and Testing**

Acceptance of samples and testing of materials and construction requirements, shall be governed by the relevant, "Table for Sampling and Testing Frequency" or as approved by the Engineer.

#### **203.3.13 Trial Section**

At least 3 days before material from each source of the asphalt concrete is first laid in the Works, the Contractor shall lay a trial area to demonstrate the compaction plant and rolling procedure selected by him for achieving the specified density.

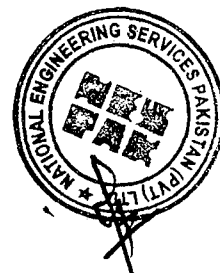
- a) The trial area shall be not less than 200 m in length and of a width to be approved by the Engineer. If the trial area complies with the Specifications, it may form part of the permanent Works;
- b) For the trial the Contractor shall use the materials, mixing and laying plant proposed for the main works;
- c) Where the required level of compaction is not achieved the trial area shall be removed and the trial repeated.

The Engineer shall approve test results and general performance of test area before actual commencement of the work.

### **203.4 MEASUREMENT AND PAYMENT**

#### **203.4.1 Measurement**

The quantities for asphaltic leveling / base course will be measured by volume in cubic meters compacted in place. Measurement shall be based on the dimension as shown on plan or as otherwise directed or authorized by the Engineer. No measurement shall be made for unauthorized areas or for extra thickness.





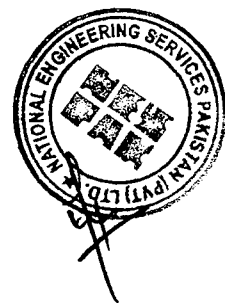
The quantity of asphaltic material used is included in the asphalt mixture and will not be measured separately.

Quantities of liquid asphalt, wasted or remaining on hand after completion of the work, shall not be measured or paid for.

**203.4.2 Payment**

The quantity determined as provided above shall be paid by volume in cubic meter compacted in place for at the contract unit price for the particular pay item listed below and shown in the Bill of Quantities, which payment shall constitute full compensation for furnishing all labour, materials, tools, plant, equipment, mixing, transporting, laying, shaping, compacting, corrections, maintenance and all the incidentals necessary for the proper completion of the work prescribed in this item. Asphalt additives or anti-stripping agent if allowed and used to meet with JMF requirement shall not be paid directly, payment shall be to be included in the respective pay items of Asphalt Base Course (Hot Plant Mix).

Pay Item No.	Description	Unit of Measurement
203a	Asphaltic Base / Levelling Course – Plant Mix, Class A	CM
203b	Asphaltic Base / Levelling Course - Plant Mix, Class B	CM



## **ITEM 305 ASPHALT WEARING COURSE – HOT PLANT MIX**

Delete this Item and replace with the following:

### **305.1 DESCRIPTION**

This work shall consist of furnishing and mixing aggregates, asphalt binder and additive material (where required) at a central asphalt mixing plant, to a specified temperature, hauling, including loading unloading, laying and compacting the mixture on an approved primed or tacked base, bridge deck or concrete pavement in accordance with these Specifications and in conformity with the lines grades and typical cross-sections shown in the Drawings or as directed by the Engineer.

### **305.2 MATERIAL REQUIREMENTS**

#### **305.2.1 Asphalt Material**

Asphalt Binder for Wearing Course shall be 60/70 penetration grade conforming to requirement in Table 301-2 section Asphaltic Materials in these Specifications.

When penetration grade asphalt 60/70 is used, the optimum ratio between bituminous material and filler shall be so determined that the bituminous filler mixture will reach its softening point, not less than eighty (80) degree centigrade when tested in accordance with AASHTO T 53.

#### **305.2.2 Mineral Aggregates**

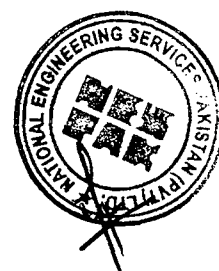
Mineral aggregates shall consist of coarse aggregate, fine aggregate and crushed rock filler material.

The coarse and fine aggregates shall be clean, hard, durable and sound particles of uniform quality, free from decomposed material, organic material, clay lumps or other deleterious substances.

The coarse aggregate which is the material retained on sieve No. 4 (4.75mm) shall consist of crushed rock 100 % particles having all faces fractured mechanically. The working face of the quarries from which mineral aggregates are being extracted shall be acceptably uniform and be free from layers, veins or intrusions of weathered rock, soil or other unsuitable minerals.

Rock to be crushed for use as bituminous concrete aggregate, shall be screened in such a manner that all material to be crushed is retained on a 75 mm (3") screen.

Fine aggregate which is material passing an AASHTO No. 4 sieve (Khaka / Stone dust), shall consist of 100% crushed limestone from rock having all faces fractured. Fine aggregate shall be stored separately. Natural sand shall not be used in the mix.



When the combined grading of the coarse and fine aggregates is deficient in material passing the AASHTO No. 200 sieve, supplemental fine aggregate shall be mineral filler consist of finely divided rock dust including dust from the plant dust collection system or cement free of deleterious material conforming to the following grading:

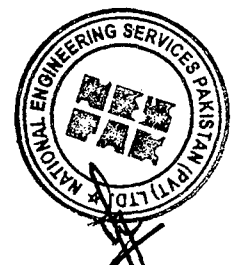
Standard Sieve Size AASHTO	Percentage Passing by Weight
No. 30	100
No. 50	95-100
No. 200	70-100

Mineral filler, at the time of use, shall be dry, free flowing, without lumps or agglomerations and conform to the requirements of AASHTO M-17.

The ratio of filler to binder should range from 1.0-1.5

The coarse and fine aggregates shall meet the following requirements:

- a) The coarse aggregate shall have a percentage loss by the Los Angeles Abrasion test (AASHTO T-96) of not more than thirty (30) percent.
- b) The coarse aggregates and fine aggregate shall have a Specific Gravity Value of not less than 2.65 & 2.60 respectively and value for absorption of water not more than 2% as determined by AASHTO T 84 and T 85.
- c) The material shall have a loss of less than ten (10) percent when subjected to five cycles of the Sodium Sulphate Soundness test according to AASHTO T-104.
- d) The Sand Equivalent (AASHTO T-176) determined after all processing except for addition of asphalt cement shall not be less than forty five (45).
- e) The fine fraction of the material shall have a liquid limit not more than twenty five (25) and a plasticity index (as determined by AASHTO T-89 and T-90) not greater than four (4). The plasticity index of mineral filler (if added separately) should not be more than four (4).
- f) The portion of aggregate retained on the 9.5 mm (3/8 inch) sieve shall not contain more than ten percent (10 %) flat and/or elongated particles (ratio of maximum to minimum dimensions = 3:1) or as determined in accordance with ASTM D 4791, standard test method for flat and/or elongated pieces.
- g) The coarse aggregate when tested by the Coating and Stripping Test (AASHTO T-182) shall have a coated area above 95 percent. In addition to this test, a test for coating and stripping shall be run after submerging the coated material in water at 60° C for 96 hours. The aggregate in this test shall have a coated area of above 80 percent.



- g) Petrographic examination of the coarse aggregate is mandatory for the approval of source. The coarse aggregates shall be checked for cationic and anionic behavior so that their affinity with the bitumen is verified.

### 305.2.3 Asphalt Concrete Wearing Course Mixture

The grading of combined aggregates prior to addition of bituminous material shall conform to gradation requirements within the following range:

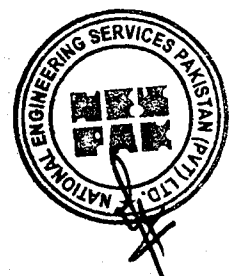
Combined Aggregate Grading Requirements as per ASTM D 3515

Standard AASHTO Sieve Sizes	Percentage Passing by Weight	
	Class A	Class B
1" (25.0 mm)	100	-
3/4" (19.0 mm)	90 - 100	100
1/2" (12.5 mm)	-	90 - 100
3/8" (9.5 mm)	56 - 80	-
No. 4 (4.75 mm)	35 - 65	44 - 74
No. 8 (2.36 mm)	23 - 49	28 - 56
No. 50 (0.3 mm)	5 - 19	5 - 21
No. 200 (0.075 mm)	2 - 8	2 - 10

The minimum binder content shall be 3.5 percent by mass of total weight of mix. The grading limits specified are based on materials of uniform specific gravity and shall be adjusted by the Engineer to compensate any variation in specific gravity of individual sizes. The grading may be varied by the Engineer on the basis of Marshall Tests to obtain optimum stability and life of completed Asphalt Concrete Pavement. Limits determined by Fuller Equation (MS - 2) should be avoided. Class A shall be adopted unless specifically advised otherwise by the Engineer.

The asphalt concrete wearing course mixture shall meet the following Marshall Test Criteria:

Compaction (number of blows each end of specimen)	75
Stability (minimum) 30 minutes/60°C	1200 kg
Flow, 0.25 mm (0.01 inch)	8 - 14 (2 - 3.5)
Percent of air voids in mix	3.5 - 5.5
Minimum voids in mineral aggregate	According to Table 5.3 MS-2, Asphalt Institute, sixth edition 1993
Percent Voids filled with Asphalt	60 - 75
Loss of stability (maximum)	20



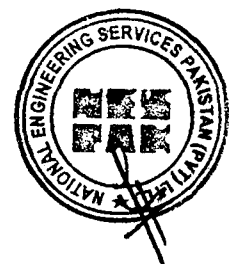
#### 305.2.4 Asphalt Concrete Job-Mix Formula (JMF)

At least eight (8) weeks prior to commencement of asphalt production, the Contractor shall start the tests for the design of a proposed JMF as described in Subsection 305.2.3 above. At least one (1) week prior to production, a JMF for the asphalt mix to be used shall be established jointly by the Contractor and the Engineer.

The JMF shall be established by Marshall Method of Mix Design according to the procedure prescribed in the Asphalt Institute Manual Series No. 2 (MS-2), Oct; 1993 Edition or the latest edition with the following recommendations taken into account:

The JMF, with the allowable tolerances shall be within the range specified in Item 305.2.3 and herein. Each JMF shall indicate a single percentage of aggregate passing each required sieve size and a single percentage of bitumen to be added to the aggregate.

- Marshall mixing temperature shall be one hundred and sixty plus/minus five ( $160 \pm 5$ ) degree centigrade at which heated asphalt produces a kinematic viscosity one hundred and seventy plus/minus twenty ( $170 \pm 20$ ) centi stoke.
- Marshall compacting temperature shall be one hundred and forty five plus/minus five ( $145 \pm 5$ ) ° C at which heated asphalt produces a kinematic viscosity of two hundred and eighty plus/minus thirty ( $280 \pm 30$ ) centi stoke.
- The combined gradation should produce a smooth curve within the master grading band for designated mix. The job-mix formula with allowable tolerances for a single test then becomes the job control grading band. If application of job-mix tolerances results in a job control grading band outside the master grading band, the full tolerances shall still apply. The asphalt content thus determined shall be used to check for compliance for stability, flow and voids filled, etc. as per the specifications. Minimum coating of bitumen film on aggregate should be 8 micron.
- The minimum bitumen binder content according to the results of the Marshall Method of Mix Design should be used provided that it will still satisfy the durability, the stability and the void content requirements.
- The optimum asphalt content shall be based on the percent asphalt content having at least 4.0% air voids for wearing course. The asphalt content thus determined shall be used to check for compliance for stability, flow and voids filled, etc. as per the specifications. Minimum coating of bitumen film on aggregate should be 8 micron.
- Prior to final approval, the proposed job mix, with a bituminous content at the permissible upper percentage limit, shall be compacted to refusal, (400 to 600 blows) and the resulting voids in the mix shall not be less than 2%.



Once JMF is established, all mixtures furnished for the project represented by samples taken from the asphalt plant during operation, shall conform thereto. Moreover upon receiving the job-mix, approved by the Engineer, the Contractor shall adjust his plant to proportion the individual aggregates, mineral filler and asphalt to produce a final mix that when compared to job mix formula shall be within the following limits.

**Tolerances for Job-Mix Formula:**

<b>Sieve Size</b>	<b>Tolerance %</b>
19 mm (3/4") and larger	± 5
9.5 mm (3/8") and 4.75 mm (No. 4)	± 5
2.36 mm (No. 8)	± 4
300 μm (No. 50)	± 3
75 μm (No. 200)	± 1
Asphalt Content (weight % of total mixture)	-0.2 % to +0.2 %

In addition to meeting the requirements specified in the preceding items, the mixture as established by the JMF shall also satisfy the following physical property.

Loss of Marshall Stability by immersion of specimens in water at sixty (60)<sup>0</sup>C for twenty four (24) hours as compared with the stability measured after immersion in water at sixty (60)<sup>0</sup>C for twenty (20) minutes shall not exceed twenty (20) percent. If the mixture fails to meet this criterion, the JMF shall be modified or an approved anti-stripping agent shall be used. No payment shall be made for anti stripping agent.

Test results along with samples shall be presented to the Engineer for verification and final approval of JMF.

Should a change of source of materials be made, a new JMF shall be established before the new material is used. Also, if results or other conditions make it necessary a new JMF will be required.

The density of the compacted mixes shall be related to the daily Marshall Density which shall be determined by making six standard Marshall Specimens from samples of the mix taken from behind the paver. The density of each sample shall be determined and compared with the mean value. Any individual result which varies from the mean by more than 0.015 gm/cc shall be rejected. Marshall Test shall be repeated on daily basis to establish daily Marshall Density for that particular day's work or one sample for 500 T productions. The daily Marshall



Density shall not vary from the Job Mix Design Density by more than  $\pm 1.0\%$ . Loss of stability shall be tested on other three Marshall Specimens from samples of the mix taken from behind the paver.

The assistance of the Engineer in the preparation of the job standard mix in no way relieves the Contractor of the responsibility of producing a bituminous mix meeting the requirements of the Specifications.

The compliance criteria contained in the Job Mix Tolerances provide an indication of the maximum acceptable value of the standard deviation for each parameter. If asphalt mix shows variation in excess of these limits, the source of variation shall be determined by the contractor and rectified by him to the satisfaction of the Specifications and the Engineer. If the excessive variations continue, the Engineer shall order stoppage of production and laying for the Works, until the Contractor has demonstrated his ability to re-establish acceptable control.

### **305.3 CONSTRUCTION REQUIREMENTS**

#### **305.3.1 Asphalt Mixing Plant**

As per Subsection 203.3.1 of these Specifications.

#### **305.3.2 Preparation of Aggregates**

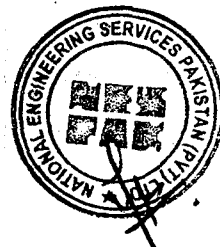
Before being fed to the dryer, aggregates for the asphalt concrete shall be separated into two or more sizes and stored separately in cold bins. One bin shall contain aggregate of such size that eighty (80) percent will pass a 2.36 mm sieve and the other bin shall contain aggregate of such size that eighty (80) percent will be retained on the 2.36 mm sieve. Should fine material be incorporated in the mix, a separate bin shall be provided in addition to the two bins mentioned above. If filler is used as a separate component it shall also be stored and measured separately and accurately before being fed into the mixer.

Asphalt cement shall be heated within a temperature range of one hundred and thirty five to one hundred and sixty three (135-163) °C at the time of mixing. All material heated above the maximum shall be considered overheated and shall be rejected and removed from job site.

Dried aggregate weighed and drawn to pug-mill shall be combined with proper amount of asphalt cement according to the job mix formula. The temperature of asphalt, except for temporary fluctuations, shall not be lower than fifteen (15) °C below the temperature of the aggregate, at the time the two (2) materials enter into the pug-mill.

In placing the materials in bins or in moving those from bins to the mixer, any method which causes segregation or uncontrolled combination of material of different grading, shall be discontinued.

Each aggregate ingredient shall be heated and dried at a temperature not to exceed



one hundred and seventy (170) degree centigrade. If aggregates contain sufficient moisture to cause foaming in the mixture or their temperature is in excess of one hundred and seventy (170) degree centigrade, they shall be removed from the bins and returned to their respective stock piles. In no case shall the temperature of an asphalt mix exceed one hundred and sixty five (165) degree centigrade when discharged from the pug-mill.

Immediately after heating, the aggregates shall be screened to required sizes and stored in separate hot bins for batching and mixing with bituminous material.

### **305.3.3 Hauling Equipment**

As per subsection 203.3.3 of these Specifications.

### **305.3.4 Laying (Spreading)**

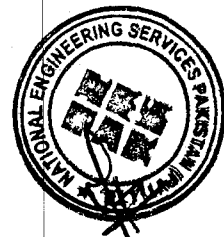
Unless otherwise directed by the Engineer, where successive layers are to be placed, the surface of existing layer shall be swept, cleaned with a power broom, or by other means as approved by the Engineer, and a tack coat is applied. Tack coat shall not be required between two lifts of Asphalt courses when previous lift is less than one day old.

Asphalt mixture shall be laid using self-contained, power-propelled units. The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The paver shall be equipped with automatic feed controls, properly adjusted to maintain a uniform depth of material ahead of the screed. It will be provided with an automatically controlled activated screed or strike-off assembly, fitted with heaters, capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and uniform thickness, required evenness and texture without tearing, shoving or gouging the mixture shown on the plans. Pavers used for shoulders and similar construction shall be capable of spreading and finishing course of Asphalt plant mix material in widths shown on the plans. The rate of delivery of material to the paver shall be so regulated as to enable the paver to be operated continuously without stoppage to ensure an even and uniform flow of material across full carriageway width, free from dragging or tearing and without segregation of the material.

When laying the mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture. The paver shall be operated at speeds which will give the best result for the type of power being used.

The mixed material shall be delivered to paver in time to permit completion of paving, finishing and compaction of mixture during day light hours.

The paver shall be equipped with automatic screed controls with sensors for either or both sides of the paver, capable of sensing grade from an outside reference line, sensing the transverse slope of the screed and providing the automatic signals





which operate the screed to maintain the desired grade and transverse slope. The sensor shall be so constructed that it will operate from a reference line or a ski-like arrangement. When the finish of the grade prepared for paving is superior to the established tolerance and, when in the opinion of the Engineer, further improvement to the line, grade, cross sections and smoothness can best be achieved without the use of the reference line; a ski-like arrangement may be substituted subject to the approval of the Engineer. The use of the reference lines shall be reinstated immediately whenever the Contractor fails to maintain a superior paving. The Contractor shall furnish and install all pins, brackets, tensioning devices, wire and accessories necessary for satisfactory operation of the automatic control equipment.

The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent variation.

Manual operation will only be permitted in the construction of irregularly shaped and or minor areas.

Whenever a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods in order to allow the contractor to use the asphalt already produced at the plant or in transit, provided this method of operation will produce results otherwise meeting the Specifications.

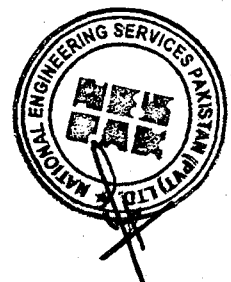
Asphalt material which is hotter than one hundred and forty (140) degree centigrade shall not be laid or deposited on bridge deck waterproofing systems unless precautions against heat damage have been agreed by the Engineer.

Asphalt concrete pavement wearing course shall not be placed on any wet or frozen surface, during rain, dust or sand storms, when wind or other weather conditions prevent the proper handling of the Asphalt mixtures or when atmospheric temperature is five (5) degree centigrade or less. Care should be taken during spreading operation under windy condition in winter, even if temperature is above five (5) degree centigrade.

The spreading operations should be immediately terminated if it begins to rain during the operation.

Hand laying of any Asphalt material will be permitted only in the following circumstances:

- a) For laying regulating courses of irregular shape and varying thickness;
- b) In confined spaces where it is impracticable for a paver to operate;
- c) For footways;
- d) At the approaches to expansion joints at bridges or viaducts;



### 305.3.5 Joints

Longitudinal joints for each course shall be offset thirty (30) centimeters from the joint in the immediate underlying course. Transverse joints shall be offset a minimum of sixty (60) centimeters from the joint of the immediate underlying course.

The Contractor will use either full width paver or two pavers in unison to avoid any longitudinal joints within the pavement width. However, where it becomes unavoidable due to break down of paver, the Contractor will ensure the leading half of half-roadway paving shall not get ahead of the trailing half of the pavement by more than half a kilometer ahead of the trailing half.

Longitudinal joints in wearing course shall, after cutting back, be of good alignment and preferably coincident with the position of carriageway markings. Except where laying in echelon, joints in wearing course shall be cut back to a vertical face and tack coated. Kerb faces, ironwork and the like in contact with wearing course shall be tack coated prior to laying of wearing course.

Longitudinal joints shall be located within fifteen (15) centimeters of the centerline of the roadway or within fifteen (15) centimeters of the centerline of a lane. Longitudinal joints shall be held to the minimum practical number. Longitudinal joints shall be formed by lapping the screed over the first layer placed, crowding a ridge of Asphalt material at the joint and crimping the ridge of material into the joint by a compaction roller while the material is hot.

Transverse joints shall be formed by cutting back the first layer placed to the full depth of the layer, removing and wasting the material, spreading new Asphalt material in sufficient quantity to create a compacted thickness equal to the thickness of the first layer. The joint shall be cross rolled with one coverage and the joint checked with a straight edge not less than four (4) meters in length. High points shall be removed and sags filled with additional Asphalt material and the joint rolled a second time. The joint shall again be checked with a straight edge, humps and sags adjusted as necessary, and rolled until the joint is complete and compacted as specified.

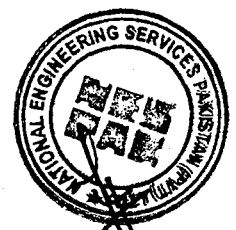
The outer edges of wearing course shall be cut back to a good alignment, parallel with the road alignment. This will require a small additional width of wearing course to be laid and cut back.

No payment shall be paid for this additional width and for all cutting back of wearing course. Tack coating of vertical faces will not be measured for payment.

### 305.3.6 Preparation of Base or Existing Pavement Surface

Before spreading materials, the surface of base or existing pavement on which the mix is to be placed shall be conditioned by application of a tack coat as specified.

After a tack coat is applied, it shall be allowed to dry until it is in the proper



condition of tackiness to receive the mix. The tack coat shall be applied only as far in advance of the placing of mix, as is necessary to obtain the proper condition of tackiness. Any breaks in the tack coat shall be repaired.

A thin coating of asphalt material shall be sprayed on contact surface of curbing, gutters, manholes, and other structures, prior to the asphalt mixture being placed against them.

### 305.3.7 Rollers

Rollers shall be steel wheel, pneumatic tyred and vibratory, or a combination thereof. The roller(s) shall be in good condition, capable of reversing without backlash, and shall be operated at speeds slow enough to avoid displacement of the asphalt mixture. The number and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. Vibratory rollers shall be acceptable for asphalt mixture compaction. The use of equipment, which results in excessive crushing of aggregate, will not be permitted.

### 305.3.8 Compaction

Asphalt material shall be laid and compacted in layer thicknesses which enable surface level and regularity requirements to be met and adequate compaction to be achieved. The maximum thickness of wearing course material laid in one pass of the paver shall be 5 cm.

When production of the mixture can be maintained and wherever practical, pavers shall be used in echelon to place the wearing course in adjacent lanes and compacted to form a surface without lateral joint.

All mixtures shall be spread at a temperature of not less than one hundred and forty five plus/minus five (145 + 5) degree centigrade.

Material shall be uniformly compacted as soon as rolling can be effected without causing undue displacement of the mixed material and shall be substantially completed while the temperature of the mixed material is greater than hundred twenty (120) degree centigrade. Rolling shall continue until all roller marks have been eliminated from the surface.

The density achieved shall be not less than 97 percent of the Marshall Density of each day's production.

Relevant test methods for density of bituminous concrete in place by Nuclear Methods such as ASTM D 2950 (latest version) and or other method as directed by the Engineer shall be used to establish the proper rolling effort and pattern to achieve the required density and to ensure achieving the specified percent compaction during the placement of the bituminous concrete as quality control testing. A calibration factor for the Nuclear Method must be established as per the equipment's manufacture's requirements, and at any time a change is made in the



paving mixture, in construction process or after every fifteen days of asphalt production whichever is earlier. Compare the results obtained to samples compacted to Marshall Density to determine percentage of compaction.

Compaction shall be carried out using 8-10 tonne dead weight smooth wheeled rollers or by multi-wheeled pneumatic tyred rollers of equivalent mass, or by vibratory rollers or a combination of these. Wearing and base courses material shall always be surface finished with a smooth wheeled roller which may be a dead weight roller or alternatively a vibratory roller in non-vibrating mode. Vibratory rollers shall not be used in vibrating mode on bridge decks.

Vibratory rollers may only be used if they are capable of achieving at least the standard of compaction of 9-tonne dead weight roller to meet the specified percent compaction of Marshall Max. Density, and shall be equipped or provided with devices indicating the frequency at which the mechanism is operating and the speed of travel which can be read from the ground.

Three steps of rolling are as follows:

#### **i) Breakdown Rolling**

Breakdown Rolling may be accomplished with static or vibratory steel-wheeled rollers.

It is important to start the rolling operation on the low side of the mat (usually the outside of the lane being paved) and progress toward the high side. The reason is that hot mixtures tend to migrate toward the low side of the mat during compaction. If rolling is started on the high side, migration is much more pronounced than if rolling starts from the low side. When adjoining lanes are placed, the same rolling procedure should be followed but only after compaction of the longitudinal joint.

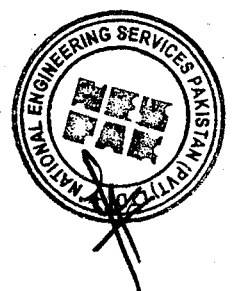
#### **ii) Intermediate Rolling**

Intermediate rolling should follow breakdown rolling as closely as possible, while the asphalt mix is still well above the minimum temperature at which densification can be achieved.

Intermediate rolling should be continuous until all of the mix placed has been thoroughly compacted. Regardless of the type of rollers used, the rolling pattern should be developed in the same manner as for breakdown rolling.

#### **iii) Finish Rolling**

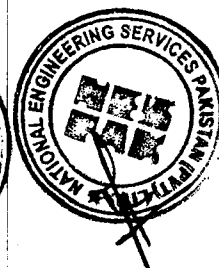
Finish rolling is done solely for the improvement of the surface. It should be accomplished with steel-tired, static-weight tandems or vibratory tandems without vibration while the material is still warm enough for removal of roller marks.



The material shall be rolled in a longitudinal direction with the driven rolls nearest the paver. The roller should first compact the material adjacent to any joints and then work from the lower to the upper side of the layer overlapping on successive passes by at least half the width of the rear roll or in the case of a pneumatic tired roller, at least the nominal width of one tyre.

The smoothness of the surface and its good acceptable ride-ability as specified shall be adhered. Following points need special attention:

- a) Variation in the surface on which the asphalt course is laid shall be free from variations and be well within the allowable tolerances.
- b) The asphalt laid through the pavers will be checked immediately after initial rolling and defects will be rectified as required.
- c) Frequent stopping/starting of paver is not allowed. Paver speed should be adjusted to average rate of delivery of material, even if some trucks are delayed in dumping loads. If stop cannot be avoided, the section of pavement at the location of stop should be checked by straightedge before and after compaction.
- d) Joint should be checked with a straightedge immediately after construction and corrections made while the material is still hot. All corrections should be made with a lute. Rakes should be used only for loosening material. Poor joints must be corrected immediately, later grinding of high spots is a poor substitute for proper construction.
- e) The paver should be adjusted so that back casting of fill in low spots is not required.
- f) Irregular rolling or letting the roller stand on hot pavement is not allowed.
- g) Non-uniform asphalt mixture shall not be allowed.
- h) Pulling of mat by screed of the paver is not allowed. This results in regularly spaced, very small, cracks in mat. The compacted mat is thinner in the vicinity of cracks due to lack of material, resulting in a corrugated surface.
- i) If the truck brakes are set too hard or the paver is bumped by a truck, irregularities occur. Truck should stop before hitting the pavers.
- j) Non-uniform temperature of material is not allowed. Cold loads do not compact to the same thickness as hot loads. The temperature of each load should be checked for uniformity as per specifications before dumping.
- k) Frequent adjustment of screed controls is undesirable. Sometimes paver crews constantly change the screed controls manually in order to maintain a uniform thickness. The result is poor riding quality.



- l) Ridability of the paved surface shall be checked regularly as per 305.3.10.2.

### **305.3.9 Trial Areas**

At least 3 days before material from each source of the asphalt concrete is first laid in the Works, the Contractor shall lay a trial area to demonstrate the compaction plant and rolling procedure selected by him for achieving the specified density.

- a) The trial shall be not less than 200 m in length and of a width to be approved by the Engineer. If the trial area complies with these Specifications it may form part of the permanent Works;
- b) For the trial the Contractor shall use the materials, mixing and laying plant proposed for the main works.

Where the required level of compaction is not achieved the trial area shall be removed and the trial repeated.

The Engineer shall approve test results and general performance of test area before actual commencement of the work.

### **305.3.10 Surface Tolerances**

#### **Surface Test by Straightedge**

After completion of final rolling, the finished surface shall be tested for smoothness with five (5) meters straightedge by the Engineer at selected locations. The variation of surface from testing edge of straight edge between any two (2) contacts shall be determined by placing it parallel and perpendicular to centerline of roadway and value thus determined should not vary more than limits prescribed by "Table for Allowable Tolerances" in these Specifications.

#### **Removing and Replacing**

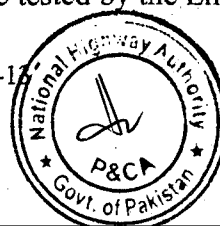
Corrections may also be made by removing the defective asphalt layer and replacing it by asphalt concrete meeting the specified requirements.

### **305.3.10 Wearing Course Thickness Tolerance**

The asphalt concrete wearing course shall be compacted to the desired level and cross slope as shown on the drawing or as directed by the Engineer.

The tolerances in compacted thickness of the wearing course shall be  $\pm 3$  mm from the desired thickness shown on the drawings. For determination of thickness one (1) core per hundred meters of each lane will be taken. If the thickness so determined is deficient by more than three (3) mm, but not more than ten (10) mm, payment will be made at an adjusted price as specified in Table-1, clause 305.4.2.(2) of these Specifications.

The surface of the wearing course shall be tested by the Engineer using 5 meters



straightedge at selected locations. The variation of the surface from the testing edge of the straightedge between any two contacts, longitudinal or transverse with the surface shall at no point exceed four (4) millimeters. The cross fall (camber) shall be with  $\pm 0.2$  percent of that specified, and the level at any point shall be within  $\pm$  three (3) mm of the level shown on the Drawings. All humps or depressions exceeding the specified tolerance shall be corrected by removing the defective work and replacing it with new material, by overlaying, or by other means satisfactory to the Engineer.

#### **305.3.11 Acceptance of Sampling and Testing**

The Engineer shall perform or supervise the performance of all quality assurance sampling and testing. The location of all samples and tests shall be recorded by roadway, lane and centerline station (kilometer).

Acceptance of sampling and testing for this item with respect to materials and construction requirements, not specified herein, shall be in accordance with the relevant "Tables for Sampling and Testing Frequency" in these Specifications.

#### **305.3.12 Surface Smoothness**

The completed asphalt wearing course shall be compacted as specified, smooth, free from ruts, humps or depressions, or irregularities. Any ridges, indentations, roller checking, or other objectionable marks left in the surface, as determined by the Engineer, shall be eliminated by whatever means are necessary and approved by the Engineer. The use of any equipment that leaves ridges, indentations or other objectionable marks shall be discontinued.

Allowable tolerances for riding quality/smoothness of finished asphalt concrete wearing course are stated in "Table for Allowable Tolerances" and Subsection 305.3.10 in these Specifications.

#### **Frequency of Testing of Cores for Compaction**

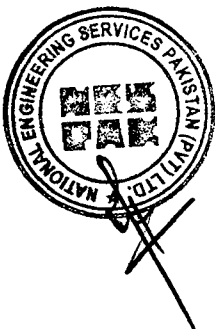
As per Subsection 203.3.9 of these Specifications.

### **305.4 MEASUREMENT AND PAYMENT**

#### **305.4.1 Measurement**

The quantity of asphalt concrete wearing course shall be measured by volume in cubic meters laid and compacted in place. Measurements shall be based on the dimension as shown on the Drawings or as otherwise directed or authorized by the Engineer. No measurement shall be made of unauthorized area or extra thickness. Quantities of material wasted or remaining on hand after completion of the work shall not be measured or paid for.

Any asphalt additive used shall not be paid directly. Its payment shall be deemed to be included in the respective pay item of Asphalt Concrete Wearing Course.



**305.4.2 Payment**

- 1) The quantity determined as provided above shall be paid for at the contract unit price respectively for each of the particular pay items listed below and shown in the Bill of Quantities, which prices and payment shall constitute full compensation for all the costs necessary for the proper completion of the work prescribed in this item. Asphalt additive or anti-stripping agent, if allowed and used to meet with JMF requirement shall not be paid directly, payment shall be deemed to be included in the respective pay items of Asphaltic wearing course.
  
- 2) **Price adjustment:** If the thickness determined as per clause 305.3.11 of this specification is deficient by more than three (3) mm, but not more than ten (10) mm, payment will be made at an adjusted price as specified in Table-1 below:

**Table - 1**

Deficiency in thickness as determined by cores	Proportional Rate of contract Price allowed
0.0 mm to 3.0 mm	100%
3.1 mm to 5.0 mm	90%
5.1 mm to 10.0 mm	80%

When wearing course is more than ten (10) mm deficient in thickness, the contractor shall remove such deficient areas and replace them with wearing course of an approved quality and thickness or the Contractor may opt to place an additional layer of wearing course asphalt, grading with a minimum thickness of 35 mm. The Contractor will receive no compensation for the above additional work.

Pay Item No.	Description	Unit of Measurement
305a	Asphalt Wearing Course Class A	CM
305b	Asphalt Wearing Course Class B	CM

305-15





**ITEM 401 CONCRETE**

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**401.1.2 TYPES OF CONCRETE**

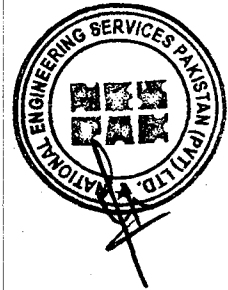
“On Ground Concrete”

In line one (1) add “minimal” after erecting. Add at the end “However walls for culvert shall be considered in elevated concrete”.

**401.4 MEASUREMENT AND PAYMENT**

**401.4.1 Measurement**

In para three (03) add at the end “against per cu.m of concrete”.



# Special Provisions



## SP 117a FORMATION OF GRANULAR MATERIAL PLATFORM

### 117.1 DESCRIPTION

This work shall consist of the formation of embankment in areas of soft embankment foundation, high water levels, where compaction of natural ground is unable to achieve the density required in Item 104 with the prescribed general method. This would also include the wet areas which cannot be dried by scarifying or other measures and which exhibit moderate to severe heaving of surface during proof-rolling.

The embankment shall consist of a working platform of the granular material followed by the embankment fill material at toe of the embankment, all placed in accordance with these specifications and the specifications for other work items involved and in conformity with the lines, grades, sections and dimensions shown on the drawings or as directed by the Engineer's Representative.

### 117.2 MATERIAL REQUIREMENTS

#### 117.2.1 Subgrade/Embankment

The subgrade/embankment material shall be as per Clause 109 and 108 respectively of General Specifications.

#### 117.2.2 Granular Material Platform

The material for the working platform shall consist of normal or processed granular fill material obtained from borrow excavation or quarry waste. This material shall conform to the following Specifications:

Size	%age of Weight Passing Mesh Sieve AASHTO T-27
37.5 mm	100
10 mm	75 - 100
# 4	60 - 80
# 10	45 - 65
# 40	25 - 40
# 100	0 - 15
# 200	0 - 5

It shall also be checked that selected grading is such that intrusion into the working platform material of subgrade or natural ground surface material is not allowed. For this condition to be met it will be required that the ratio as below shall be checked and followed:

$$\frac{D15 - (\text{Granular Fill Material})}{D85 - (\text{Natural Ground Material})} < 5$$

D85 and D15 mean the practical diameters corresponding to 85% and 15% respectively, passing (by weight) in a grain size analysis.



### 117.3 CONSTRUCTION REQUIREMENTS

#### 117.3.1 Subgrade/Embankment

The subgrade / embankment above the granular material platform shall be compacted to 95% AASHTO T-180 D regardless of zone of embankment within which it falls.

#### 117.3.2 Granular Material Platform

Prior to laying of granular material platform, the pond water of water logged area upon which embankment is to be placed, shall have been dried and drained or kept drained of all surface water prior to commencing of fill and all clearing and grubbing shall have been performed, manually if necessary, in accordance with the relevant specifications.

Construction of the granular fill layer shall proceed from one end of the soft area by using the granular fill as a ramp for further granular fill transport. The thickness of the granular fill working platform, as prescribed shall be as shown on the Project drawings or as directed by the Engineer's Representative and the width shall be that of the embankment or part as directed by the Engineer's Representative. The placement and compaction of the working platform including boxing material shall be carried out by the use of appropriate light equipment, in layers, if necessary. The placement, spreading and compaction of the Granular Material Platform shall be carried out by using light equipment. The top 15 cm of the platform shall be compacted to at least 90% AASHTO T-180 density.

In those areas of high water levels and salinity with soft subsoils and where embankments are high such as approach fills to structures, special provisions shall be made to measure and determine likely fill settlements which may occur. These preconditions are necessary in order to specify particular construction procedures which may be necessary and to establish the time at which the pavement structure can be placed to avoid cracks and subsidence of these layers.

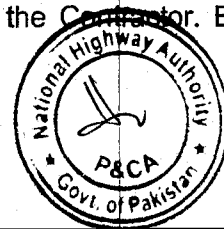
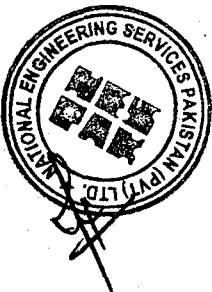
In particular, additional compaction of the fill material and its adequate protection shall be required to prevent and underscore the risk of "collapse" settlement.

No extra payment under this item shall be made to the Contractor for re-working, re-instatement, replacement of granular material which has become slushy, or replenishing of granular material for whatever reason.

### 117.4 MEASUREMENT AND PAYMENT

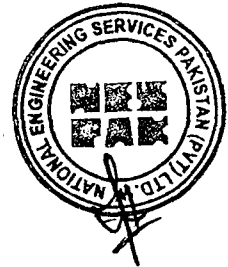
The quantities measured against this item as shown on the drawings with respect to line and grades shall be paid for at the contract unit price for the pay items listed below and shown in the Bill of Quantities. These prices and payments shall constitute full payment and compensation for providing including hauling, processing, placing at site and compacting as specified, replenishing granular material for remedying loss of material due to traffic and sinking of granular material platform during construction due to whatever reason, including all equipment, labour, material and all other costs related to the completion of works in all respects.

On first-time completion and approval of granular material platform, only 75% payment for pay item SP 117a shall be made to the Contractor. Balance 25%



payment for pay item SP 117a shall be made to the Contractor only when the granular material platform is no more required to serve as detour road and it has been re-worked, re-instated or replaced as directed by the Engineer's Representative and is re-approved and ready to receive oncoming layer of embankment.

Pay Item No.	Description	Unit of Measurement
SP-117a	Formation of Granular Material Platform.	CM



SP 117b      FORMATION OF EARTHEN DOWEL

---

**117.1 DESCRIPTION**

This work shall consist of construction of earthen dowel at shoulder edge on both sides of carriageway as shown on the drawings and or as directed by the Engineer.

**117.2 MATERIAL REQUIREMENTS**

The material for earthen dowel shall be any suitable soil obtained from roadway excavation, borrow excavation or any other source as approved by the Engineer having a plasticity index of 6 or more. The material shall conform to the requirements of clause 108 of the specifications. It should be free of organic and other deleterious substances.

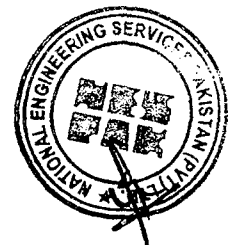
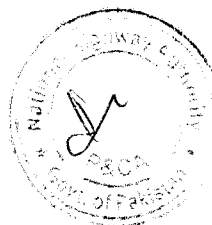
**117.3 CONSTRUCTION REQUIREMENTS**

The earthen dowel shall be constructed at shoulder edge on both sides of carriageway as per dimensions shown on drawings or as directed by the Engineer. No specific density requirements are specified for earthen dowels, it shall be as directed the Engineer. Preferably they shall be graded and compacted with at least two passes of vibratory roller to the satisfaction of the Engineer.

**117.4 MEASUREMENT AND PAYMENT**

The quantities measured against this item as shown on the drawings with respect to line and grades shall be paid for at the contract unit price for the pay items listed below and shown in the Bill of Quantities. These prices and payments shall constitute full payment and compensation for providing including hauling, processing, placing at site and compacting as specified including all equipment, labour, material and all other costs related to the completion of works in all respects.

Pay Item No.	Description	Unit of Measurement
SP-117b	Formation of Earthen Dowels.	CM



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**SP-414 SOIL INVESTIGATIONS AT BRIDGE SITES**

---

**414.1 SCOPE OF WORK**

The Contractor shall carry out confirmatory boring at bridge and Flyover sites at locations marked on the drawings or as directed by the Engineer's Representative.

The purpose of the Work specified herein is to determine the type, nature, arrangement, thickness and texture of the various subsurface strata, the conditions and the Engineering characteristics of the subsurface materials as they exist to the depth and at the locations specified. This is to be accomplished by means of drilling, in-situ testing, collection of disturbed and undisturbed soil and water samples and laboratory testing.

The Contractor shall carry out the specified works under the supervision of the Engineer's Representative.

#### **414.1.1 Plant and Equipment**

The Contractor shall keep at-least one rotary drill machine and one percussion winch along with accessories on the site to meet the requirements of the Work. The plant and equipment shall be in good operating condition and capable of performing efficiently the Work as set forth.

#### **414.1.2 Drillers and Supervisory Staff**

The Contractor shall provide qualified, experienced, orderly and thoroughly competent persons at all times including geotechnical engineers or engineering geologists who shall conduct and supervise drilling, sampling, logging and in-situ testing at the site. The Contractor shall remove any of his employees from the site that in the opinion of the Engineer does not meet these requirements.

The Contractor shall make his own arrangements for housing of his personnel, security and storage of the equipment and supplies at the site.

#### **414.1.3 Setting up at each Hole**

The Contractor shall make all the necessary arrangements for setting-up plant and equipment at each location, carrying out the work specified, preparation and reinstatement of the work areas, improvement to access routes and all other temporary works.

#### **414.1.4 Measurement of Quantities**

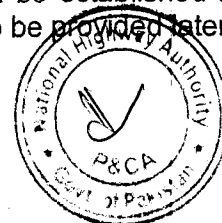
The quantities shown in the Bill of Quantities are only approximate. The payment shall be made on the basis of actual work performed in accordance with the Specifications.

#### **414.1.5 Submission of Field and Laboratory Data**

The Contractor shall supply complete field and laboratory investigation data to the Engineer's Representative within the time set-forth for completion of works. This data shall include copies of all the approved logs and test records provided during the course of the Contract including any alterations or amendments required by the Engineer's Representative.

#### **414.1.6 Location of Investigation Points**

- a) The locations of investigation points shall be established in the field by the Contractor on the basis of the Drawings to be provided later or as directed by



the Engineer's Representative. Locating the boreholes accurately in the field shall be the sole responsibility of the Contractor.

- b) It is to be understood that further Drawings may be issued by the Engineer showing the revised locations of investigation points.
- c) All the investigation points shall be located by the Contractor through field survey to an accuracy of 1 m in plan and 0.05 m in ground elevation.

## **414.2 WORK METHODOLOGY**

### **414.2.1 Investigated Areas**

The location of the boreholes will be selected as directed by The Engineer. The Engineer will specify from time to time during the Contract period, the exact location and reference number of all holes. To locate the holes accurately in the field shall however be the Contractor's responsibility.

### **414.2.2 Casing**

A hole shall be cased in any stratum which is friable or not sufficiently strong to stand unsupported, or as and when directed by the Engineer's Representative.

The Contractor shall ensure that casings are of a suitable size and inserted in such a manner as to render them recoverable. The Contract Rates for drilling shall be deemed to include the supply, insertion and recovery of casing including any damage, loss or delay caused by difficulty or failure in recovering casing.

### **414.2.3 Removal of Casing**

Casing shall neither be removed from any hole nor any filling introduced into it until permission is given by the Engineer. This permission will normally be given as soon as work in the hole is completed and the groundwater level has been measured.

As far as possible the Contractor shall avoid leaving a hole overnight after he has begun to withdraw the casing and before he has finished.

### **414.2.4 Supplementary Holes**

Abandoned holes and / or the holes from which unsatisfactory samples have been obtained and/or in which unsatisfactory field tests have been performed due to the negligence of the Contractor shall be supplemented by other holes adjacent to the original location. The exact location of such supplementary holes shall be specified by the Engineer in the field.

The depth where the unacceptable holes were abandoned or to the depths where unsatisfactory samples were obtained or unsatisfactory field testing was performed may be made by any method selected by the Contractor that in the opinion of the Engineer will permit satisfactory field testing and sampling below those depths at which original hole was abandoned shall be carried out using only the specified method of advancing the hole.

No payment will be made for that portion of the supplementary hole above the depth paid for in the unacceptable hole.

### **414.2.5 Groundwater Level**





The groundwater level in holes shall be determined after completion of the hole or when required by the Engineer, as follows:

Clear water shall be added or the hole shall be bailed-out as necessary to bring the water level to the expected groundwater level as directed by the Engineer and the water level shall be measured and recorded at intervals of 6 hours for a period of twenty four (24) hours thereafter.

#### **414.2.6 Backfilling Holes**

Boreholes shall be backfilled with grout as directed by the Engineer.

Grouting for backfilling holes shall consist of a mud formed by mixing one (1) part by weight of bentonite with ten (10) parts of water, to which two parts by weight of cement shall be added after the bentonite and water have been thoroughly mixed. Alternatively, holes may be backfilled with purpose-made pellets of bentonite or bentonite/cement, provided they are of a size which, in the opinion of the Engineer, is compatible with the size of hole. If there is no standing water in the hole, grout may be poured in from the top. If there is standing water in the hole, the grout shall be fed into the bottom of the hole by a tremie pipe, the end of which shall always be below the groundwater junction while grouting is being carried out.

Grout backfill shall be taken up to 30 cm below the original ground level. Any apparent loss of grout due to leakage or consolidation within one week shall be made-up with fresh grout and then the remaining depth of the hole shall be filled with concrete.

#### **414.2.7 Logs**

Logs of boreholes shall be provided on an approved specimen. These shall include descriptions of all strata including details of the soil macrofabric (such as frequency, orientation and nature of fissures) and details of samples taken, and an account of all observations and field tests. Logs of boreholes shall include notes on the nature, quantity and colour of the drilling fluid returns. All logs shall be subject to the approval of the Engineer and two draft copies shall be submitted to the Engineer, not more than two days after the hole is backfilled. Soil descriptions shall conform to ASTM designation D 2488 and classified according to ASTM designation D 2487. All depths and thicknesses of topsoil and strata shall be recorded in meters and all reduced levels shall be recorded in meters with reference to Survey of Pakistan datum. Accurate determination of ground levels at all the hole points is the Contractor's responsibility for which no extra payment shall be made.

#### **414.2.8 Contractor's Responsibility for Records**

The presence of the Engineer or any of his staff and their keeping separate drilling records shall not relieve the Contractor of any of his responsibilities for keeping records.

#### **414.2.9 Order of Work**



The order in which the work is to be accomplished shall be determined and approved in the field by the Engineer.

#### 414.3 DRILLING

##### 414.3.1 Depth of Drilling

Drilling would generally be required up to a minimum of 45 meters depth or at least 5 m below the pile tip level, whichever is more or as directed by the Engineer.

##### 414.3.2 Accuracy of Alignment of Holes

Boreholes will be within 2 degrees of the vertical unless the Engineer's Representative has ordered the drilling of an angled hole in which case the hole angle shall be within 5 degrees of the angle specified.

##### 414.3.3 Drilling Plant

The drilling plant and ancillary equipment to be mobilized at the site should be adequate to advance the boreholes in an efficient manner, to the required depths.

Rotary drilling rigs shall be of the hydraulic feed type equipped with side discharge type fish tail and tricone bits for drilling. Bits and casing shall conform to B.S. 4019; Part I; 1974 or an approved equivalent.

Drilling bits shall be of side discharge type designed to prevent unnecessary disturbance of soil at bottom of the hole by flow of drilling fluid, unless the Engineer directs otherwise.

##### 414.3.4 Drilling Procedure

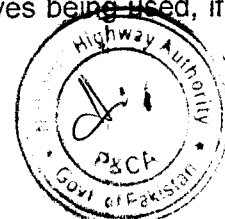
The method of drilling shall be of any approved standard and accepted method by means of which a hole of specified diameter is extended to the desired depth. The normal method of drilling shall be rotary unless gravelly strata are encountered where percussion may be used.

During drilling the Contractor shall regulate the drilling operation which ensures minimum disturbance in the underlying material in which the in-situ testing and sampling is to be carried out.

In rock, core drilling shall be carried out in such a manner and using such sizes of bits, that the maximum core is recovered. This requires close surveillance of the flushing media, drilling pressures, lengths of runs, use of appropriate core barrels and other factors relevant to the nature of the material drilled. The drill bit shall be withdrawn and core removed as often as may be necessary to secure the maximum possible amount of core. In soft or friable formation, dry drilling techniques may be required using single tube core barrel with tungsten carbide bits as directed by the Engineer. The cores would be placed in core boxes in a proper manner.

##### 414.3.5 Stabilizing of Holes

Drilling mud of suitable consistency shall be used during rotary cum wash boring to stabilize the walls of boreholes by preventing caving-in and to avoid disturbance of the sampling horizons. The drilling mud shall be a mixture of bentonite and water with approved chemical additives being used, if required, to



assist in modifying its density and viscosity. The density and viscosity shall be selected considering such factors as hole stability, cutting operation and undisturbed samples recovery.

Where drilling mud is not effective, casing of appropriate size and strength may be used subject to the approval of the Engineer. It will be responsibility of the Contractor to use appropriate means to stabilize the walls of the boreholes.

It shall be ensured that there is no jetting action of the drilling fluid. The minimum amount of drilling fluid necessary to carry away the cuttings shall be used. During drilling the Contractor shall regulate the pressure of the drilling fluid to ensure minimum disturbance to the underlying material in which the in-situ testing and sampling is to be carried out.

#### **414.4 SAMPLING**

##### **414.4.1 General**

The Contractor shall take disturbed or undisturbed samples from any borehole when ordered to do so by the Engineer. This shall include the provision of all necessary sampling equipment, tubes and containers, crates and boxes, as well as handling and transportation to the approved laboratory or store at site.

##### **414.4.2 Approval of Equipment**

No equipment or containers shall be used unless and until approved by the Engineer.

##### **414.4.3 Care of Samples**

The Contractor shall be responsible for the safe keeping of samples of all kinds until these have been handed over to the designated laboratory or disposed-of on the Engineer's instruction as the case may be. Any sample lost, damaged or showing signs of deterioration while in the Contractor's care shall be replaced by the Contractor at no expense.

##### **414.4.4 Labeling Samples**

All disturbed and undisturbed soil samples and water samples taken from holes shall be clearly labeled. Each label shall include the following information:

- a) Name of Contract
- b) Reference number of the holes
- c) Reference number of sample
- d) Date of sampling
- e) Brief description of the sample (e.g. stiff brown silty clay)
- f) Depth of the top and bottom of the sample below ground level
- g) Number of the sampler tube

Tubes and crates for undisturbed samples shall be labeled "Do not jar or vibrate" and "Haul and transport in a horizontal position".

##### **414.4.5 Disturbed Samples**

In all the boreholes, small disturbed samples shall be taken at the top of each stratum, and at intervals as directed by the Engineer. Material from the cutting shoes of open drive undisturbed samples, and from the split spoon sampler used for Standard Penetration Tests, shall also be taken as disturbed samples.



#### 414.4.6 Undisturbed Sampling

Undisturbed sampling from boreholes shall be done by Shelby tube or Pitcher/Denison sampler or as directed by the Engineer. The undisturbed samples should be properly sealed and preserved as directed by the Engineer.

#### 414.4.7 Cores

The cores obtained from boreholes shall be carefully removed from the core barrel and placed in the boxes in the correct sequence, with increasing depth from left to right and top to bottom in the box. Coloured photographs of cores shall be taken at site.

Where the core is contained in an expandable triple tube liner, the ends of the tube shall be sealed and waxed as directed by the Engineer.

Each core run shall be segregated by labeled wooden blocks 25 mm thick and the depth of the bottom of each run shall be marked on the partitions in the core box with paint.

No box shall contain more than 3 meters of core.

#### 414.4.8 Core Samples

Selected cores, preferably not less than 30 cm in length, shall be preserved as core samples. The preservation would consist of clearance of any loose sludge, waxing of cores, packing in wooden boxes using sawdust and labeling before transportation to the testing laboratory.

#### 414.4.9 Water Samples

The Contractor shall take water samples from holes when directed by the Engineer before the addition of water to the hole unless it is unavoidable. If necessary, the hole shall be bailed-out before taking the sample to ensure that any potential contaminant is removed. No fuel or other potential contaminant shall be allowed to enter the hole. The method of sampling shall be as approved by the Engineer. Samples shall only be stored in approved, air tight and scrupulously clean, containers and shall not be less than 1 litre in volume.

#### 414.4.10 Transportation of Samples

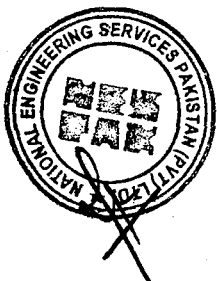
All samples shall be shifted to the store at the site, the day they are collected. Samples in tubes shall be kept and transported with the tubes in a horizontal position.

The samples shall be continuously transported to the testing laboratory on conclusion of every borehole and on the instructions of the Engineer. The laboratory for testing shall be approved by the Engineer.

#### 414.5 IN-SITU TESTS

##### 414.5.1 Standard Penetration Tests (SPTs)

When directed by the Engineer the Contractor shall carry out Standard Penetration Tests (SPTs) in boreholes. The penetration resistance 'N' shall be expressed as the number of blows of a 63.5 kg hammer freely dropping 76.2 cm required to force the standard split tube sampler 30.5 cm into the soil.



Standard Penetration Test (SPTs) shall be conducted in the boreholes in accordance with ASTM 1586 generally at 1 meter depth interval or as directed by the Engineer at the site.

**414.6 LABORATORY TESTING**

**414.6.1 General**

The samples shall be tested in a laboratory approved by the Engineer. The Engineer shall have access to the laboratories to supervise and check the laboratory testing of the samples. The testing shall be carried out in accordance with ASTM, BSS or AASHTO Standards or as directed by the Engineer. The Contractor shall arrange to carry out the following laboratory tests on the specified samples of the subsoil materials. The samples to be tested and the tests to be carried out for each sample shall be specified by the Engineer.

**414.6.2 Type of Tests**

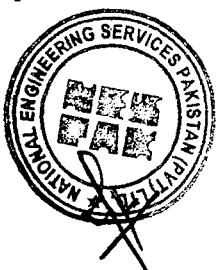
Sr. No.	Name of Test	Standard
i.	Grain size analysis	ASTM D 422
ii.	Liquid limit, plastic limit	ASTM D 4318
iii.	Specific gravity	ASTM D 854
iv.	Unit weight of soil	
v.	Unconfined compression (soil)	ASTM D 2166
vi.	Unconfined compression (rock)	ASTM D 2938
vii.	Natural moisture content	ASTM D 2216
viii.	Consolidation	ASTM D 2435
ix.	Direct shear	ASTM D 3080
x.	Triaxial compression test	ASTM D 4767
xi.	Sulphate content of Soil	BS 1377
xii.	Organic matter content of soil	BS 1377
xiii.	Total dissolved salts of soil	BS 1377
xiv.	Chloride content of soil	BS 1377
xv.	Chemical analysis of water	BS 1377
	a) Sulphate content of water	
	b) Total dissolved salts of water	
	c) Chloride content of water	
	d) pH of water	

**414.7 RECORDS AND REPORTS**

**414.7.1 Records**

a) The Contractor shall keep accurate logs and records of all work accomplished under this item. All such records shall be preserved in good condition and order by the Contractor until these are delivered and accepted by the Engineer. The Engineer shall have the right to examine such records at any time prior to their delivery to him. Separate logs shall be made for each borehole. The following information shall be included on the logs or in the records for boreholes:

- i. Borehole number or designation and elevation of top of borehole.
- ii. Method of drilling holes.



- iii. Dates and time by depths when hole was performed.
  - iv. Type of drilling fluid used.
  - v. Depths at which samples were recovered or attempts made to collect samples along with designation, thickness and type.
  - vi. Record of SPT on borehole log.
  - vii. The classification or description by depth of the materials samples including a description of condition of compactness or stiffness of soil materials encountered and moisture conditions.
  - viii. Depth of groundwater level if encountered.
  - ix. Depth of bottom of borehole.
- b) The Contractor shall furnish the Engineer with the record as specified above in duplicate, not later than 48 hours after completion of each borehole.
- c) The presence of Engineer or the keeping of separate records by the Engineer shall not relieve the Contractor of the responsibility for the work specified in this Section. Payment shall not be made for any work for which the records have not been furnished by the Contractor.

#### 414.7.2

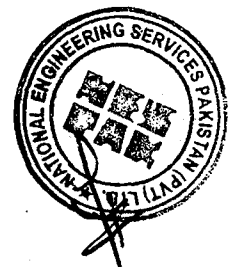
#### Reports

- a) The results of each borehole and the field tests carried out shall be communicated to the Engineer as follows:
- i. Oral reports as the work proceeds.
  - ii. Three sets of complete data of the work within two (2) days of the date of completion of borehole.
- b) The data shall comprise:
- i. A site plan showing the position of the boreholes and giving their map reference.
  - ii. The borehole logs
  - iii. Complete results of field tests
  - iv. Comments on any point which the Engineer has put-up to the Contractor for inquiry and investigation during the Works.
- c) Complete results of laboratory tests shall be communicated to the Engineer within seven (07) days of the date of completion of borehole.

#### 414.8

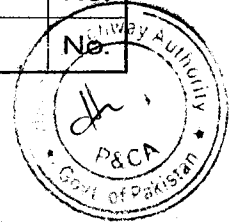
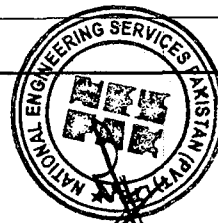
#### MEASUREMENT AND PAYMENT

The measurement and payment for the Work specified in the Contract for drilling of bore holes, collection of disturbed, undisturbed and rock core samples, performing the standard penetration tests, laboratory testing and compilation and submission of results shall be done and paid for as per the pay item given in the BOQ, which payment shall be full compensation for furnishing all labour, material, tools, equipment and incidentals and for performing all the work involved in this item as mentioned above in this specification.



Pay Item No.	Item Description	Unit
SP-414 (a)	6" minimum dia drilling straight rotary/ Percussion including back filling of holes from NSL upto 45m depth or till the rock level which ever is met earlier.	LM
SP-414(b)	Perform SPT at 1 m interval i/c collection, preservation & Transportation of disturbed samples to an approved Laboratory.	No.
SP-414(b-1)	Continuous core drilling in bedrock up to a maximum of 5 m depth below rock strike level, including determination of core recovery/ RQD, preservation of core samples in core boxes, labelling, waxing of selected core samples, photography of rock cores and transportation of core samples to the laboratory. In case core recovery is less than 80% reduce run length to 0.5 m.	LM
SP-414(c)	Collection of undisturbed soil samples from boreholes using Shelby pitcher/denison sampler i/c preservation and transportation of samples to an approved Laboratory.	No.
SP-414(d)	Performance of FDT in test pits through sand replacement method i/c moisture content determination.	No.
SP-414(e)	Excavation of testpits upto 1.5 m depth along road allignment including backfilling of pits to original condition.	M
SP-414(f)	Collection of undisturbed block samples from test pits at appropriate location as directed by the Engineer.	No.
SP-414(f1)	Collection of composite bulk sample (atleast 60 kg for sandy/clayey soils and 120 kg for gravelly soils)	No.
SP-414(g)	Collection & preservation of water samples from bore holes & transportation to an approved Laboratory.	No.
SP-414(h)	Laboratory Testing	No.
i.	Grain size analysis.	No.
ii.	Hydrometer analysis.	No.
iii.	Atterberg limits	No.
iv.	Specific gravity	No.
v.	Natural moisture content	No.
vi.	Bulk density & Dry density (Soil/rock cores)	No.
vii.	Direct shear test	No.
viii.	Consolidation test (collapse/swell potential)	No.
ix.	Unconfined compression test (Soil/rock cores)	No.
x.	Chemical analysis of soil	No.
xi.	Chemical analysis of water	No.
xii.	Submission of Investigation Report (triplicate)	No.
xiii.	CBR	No.
xvi.	Modified Proctor Test	No.

SP-



**1. General**

Expansion joints will follow Specifications of AASHTO-SS-Division II-section 19 "Bridge deck joints seals"

The Contractor shall submit to the Engineer, complete documentations about the Expansion joints he intends to use for the movements shown on the Drawings, including references of the last 10 years, material Specifications for metal, rubber and bonding between them, fixations, and test certificates from authorized laboratories showing that the proposed joints meet the specifications.

Elsewhere the submittal will be accompanied by samples of at least 0.50m, with its fixations.

The expansion joints shall satisfy the following functional requirements:

1. It shall withstand traffic loads of the highway, and accommodate movements between the deck and abutment or the adjacent deck.
2. It shall have good riding quality and shall not cause any inconvenience to road user.
3. It shall not cause skidding hazard.
4. It shall not generate excessive noise or vibration during the passage of vehicles
5. Parts liable to wear out shall be easily replaceable.
6. It shall be watertight and will have provision for carrying away water and silt.
7. It shall be easy to inspect and maintain.
8. It shall be resistant in hot and very sunny climate.

**2. Construction Requirements**

The methodology of placing the expansion joint will be clearly described by the Contractor with a complete set of drawings.

Connection or overlapping between roadway and walkway expansion joints will be clearly shown.

Connection with water proofing of the deck will be detailed.

All necessary provisions in deck reinforcement will be indicated.

Initial gap at the time of placing will be clearly indicated and justified.

The second stage reinforced concrete for fixations, if any, will be Class Y concrete and will be included in pay item SP- 417.





**3. Measurement and Payment**

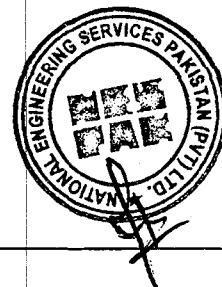
**3.1 Measurement**

The length of computed joints for roadway is measured in linear meter between the faces of the kerbs, plus 150 mm height on each bridge railing.

**3.2 Payment**

The accepted quantity measured as provided above shall be paid for at the contract unit price respectively for the pay items listed below and shown in the Bill of Quantities which price and payment shall be full compensation for furnishing all materials, labour, equipment, tools and incidentals and any work pertaining to expansion joints and which is not paid for separately, necessary to complete the item.

<b>Pay Item No</b>	<b>Description</b>	<b>Unit of Measurement</b>
SP-416	Manufactured trade mark expansion Joints for roadway, for (25-30) mm movement	M



**SP-417 BITUMEN COATING**

417.1 **Scope**

The work under this section of the Specifications consists of furnishing all plant, labour, equipment, appliances and materials and in performing all operations related to water proof treatment to foundations and basement structures complete in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the Contract.

417.2 **Submittal**

Samples of all materials proposed for use under this section shall be submitted to the Engineer for approval.

417.3 **Materials**

Bitumen 10/20 grade.

417.4 **Delivery Storage and Handling**

Materials shall be protected from damage during loading shipment delivery and storage. Non-staining materials shall be used for blocking and packing.

417.5 **Preparatory Work**

All surfaces to be treated shall be dust free and dry. Application of finishes shall not start unless the preparatory work has been inspected and approved by the Engineer.

417.6 **Bitumen Coating / Painting In Foundation Sub-Structures, Under Floors**

Bitumen Painting

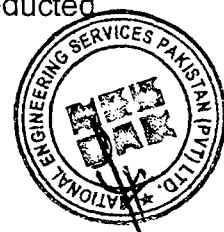
All surfaces to be bitumen painted shall be thoroughly cleared of any accretion, dust, dirt etc. by scraping, wire brushing or as directed by the Engineer. The surface shall be primed with a coat of asphalt oil used at the rate of not less than 0.5 liters per square meter. Two coats of hot bitumen paint shall be applied at the rate of 1.0 kg/Sq.m each coat. The first coat shall be allowed to dry for about 6 hours before applying the second coat. During operation of painting great care shall be taken to avoid air bubbles. The manufacturer's instructions shall be followed.

417.7 **Measurement and Payment**

417.7.1 **Bitumen Coating**

417.7.1.1 **Measurement**

Measurement for compliant completed works will be made on the basis of actual area coated in square meter as shown on drawings or as directed by the Engineer. All openings left in area shall be deducted



417.7.1.2 **Payment**

Payment will be made for agreed measured quantity of work on the basis of unit rate per square metre quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

Pay Item No	Description	Unit of Measurement
SP-417	Bitumen Coatings to Cement or Concrete surface using 0.60 Kg/sq.m.	SM



**614.1 DESCRIPTION**

The work shall consist of supply and installation of delineators /angle reflectors at locations detailed on drawings or as directed by the Engineer, complete in all respect. The work will be executed as per item 607 "Traffic Road Signs and Safety Devices of general specifications with amendments as follows:

In item 607 "Traffic Road Signs and Safety Devices" of general specifications, add in line 1, after "furnishing" insert ",", delete "and" and after "traffic signs" insert "and delineators"

Add at the end of para:

Unless otherwise shown on the Drawings, all signs shall be lettered in both Urdu and English. In case of any discrepancy between NTRC requirements and General Specifications, the requirements of NTRC shall govern.

**614.2 MATERIAL REQUIREMENTS**

In item 607 "Traffic Road Signs and Safety Devices" of general specifications, add new para under head "Material Requirement" as follows:

Materials shall be of new stock unless otherwise shown on the Drawings or ordered by the Engineer's Representative and shall conform to the item 607 of general specifications with amendments as mentioned below:

**614.2.2 Rubber Washer**

In 607.2.6, Add at the end "Thickness of rubber washer is as given below:

On top	3 mm
On Bottom	2 mm

**614.2.3 Concrete Foundation Blocks**

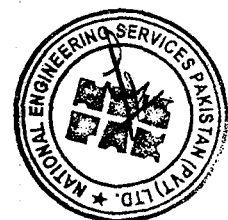
In 607.2.9, in line 1, delete "Class A" and replace with "Class A1".

In line 3, after "mm", add "or as shown on the drawings or as directed by the Engineer."

**614.2.4 Road Posts and Hazard Markers**

In 607.2.10, in line 6, delete "with standing" and replace with "withstanding".

**614.2.4 Excavation and Backfilling**



In 607.3.1, Add at the end of para 3:

Concrete shall be placed against the undisturbed excavated faces, except that the top fifteen (15) centimeters of each footing shall be formed. Forming of the entire footing will not be permitted unless approved by the Engineer. Concrete shall be thoroughly rodded and spaded so as to eliminate all voids. Tops of footings shall be finished with a wood float and all exposed edges shall be rounded with an edger.

Backfill shall be thoroughly compacted by mechanical tampers, and care taken to prevent damage to the finished concrete. Backfill shall be brought up level with the finished ground line. Pipe post bases and/or posts set in concrete shall be firmly supported, plumb, vertical and at the proper elevation.

In case precast concrete foundations are used, these shall be of the concrete class 'A1' and of the sizes as shown on the drawings.

**614.2.5 Erection of Posts**

In 607.3.2, In line 3, delete "the" written in between "to" and "prevent".

**614.2.6 Installations of Safety Devices**

In 607.3.5, In line 11, delete "a" written in between "for" and "prohibiting".

**614.2.7 Sign Faces**

In item 607.3.6, following amendments be made as mentioned below:

**a) Design**

In serial No. 3, line 1, delete "italics" and replace with "Smalls".

In serial No. 4, delete "21 cm" and replace with "35 cm".

In serial No. 5, delete "17 cm" and replace with "25 cm".

In serial No. 5, delete "italics" and replace with "Small".

In serial No. 6, delete "3.5 cm" and replace with "10 cm".

In serial No. 10, delete "4 cm" and replace with "2.3 cm".

In serial No. 11, delete "23 cm" and replace with "35 cm".

In serial No. 13, delete "Size of letter for km. Height" and replace with "Height of letter for km".

**614.2.8 Storage of Signs**



After 607.3.7, add the following:

**614.2.9**      **Painting**

The rear sign face of all signs shall be painted with two (2) coats priming paint pigmented with chromates of chromes (excluding lead chromes) plus two (2) coats of weather-resisting dull silver gray paint. Where connection of large aluminum sheet signs to a steel stiffening frame is required, the studs or screws, bolts and washers shall be painted to properly match the color of the surrounding material.

All painting shall conform to the requirements of Section 413 of General Specifications.

**614.2.10**      **Placement and Orientation**

The Engineer will approve and mark the longitudinal location of each sign on the working drawings submitted by the Contractor.

The sign shall be laterally positioned from the shoulder or curb as shown on the approved drawings or directed by the Engineer.

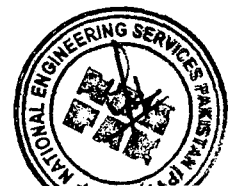
The Contractor shall stake the location of each sign support and shall get its approval from the Engineer prior to carrying out excavation for foundations. The Engineer may order change in location due to site constraints. No separate payment shall be made to the Contractor on account of such change if the change is made before fixing of the sign support in concrete block.

The Contractor shall be responsible for the proper elevation, off-set, level and orientation of all signs he erects. He shall exercise due care on the preservation of stakes for his and the Engineer's use. If any stakes are lost, damaged, displaced, or removed, the Contractor shall have them reset at his own expense.

Unless otherwise shown on the drawings all signs shall be erected so that the edge and face of the sign are truly vertical and face is at an angle of ninety three (93) degrees to the centerline; that is, facing slightly away from the centerline of the lane which the sign serves. Where lanes divide or are on sharp curves, the Contractor shall orient sign faces as indicated on the Drawings or by the Engineer so that they will be most effective both during day and night and so as to avoid specular reflection and glare. All sign supports shall be plumbed.

**614.2.11**      **Sign Posts**

Lengths of posts shown on the drawings for signs are for bidding purposes only. When progress of the work permits, the Engineer will authorize the location of each sign, with the station and offset distance from the edge of pavement. The Contractor shall be responsible for determination of post lengths to provide the vertical clearance shown on the drawings. Field cutting of posts shall be performed by sawing.



"Sign Post Support Assemblies" shall be fabricated as detailed on the drawings. Test specimens for pipe shall be taken at least fifteen (15) centimeters from one (1) end of the pipe, instead of at the ends as specified in ASTM A 53, Grade B. When Galvanizing is specified assemblies shall be hot-dip galvanized after fabrication. All welds shall be mechanically cleaned before Galvanizing. Galvanized materials on which the Galvanizing has been damaged in transporting, handling, or erection will be rejected or may, with the approval of the Engineer, be repaired in the field by the zinc alloy stick method. Required field welds and adjacent areas on which the Galvanizing has been damaged shall be galvanized by this same method. The zinc alloy stick shall be cast from zinc, tin, and lead in combination with fluxing ingredients. The compound shall be completely liquid at a temperature not lower than two hundred and forty six (246) degrees C. The area to be re-galvanized shall be thoroughly cleaned, including the removal of slag on welds. The surface shall be heated with an oxyacetylene torch to approximately three hundred and fifteen (315) degrees C, and the alloy stick rubbed over the surface to fix a deposit. While the alloy is still liquid, a clean wire brush shall be used to smooth the deposit evenly over the entire area being re-galvanized. If a heavy deposit or build-up is required to match the original coating, more alloys shall be added immediately to the initial bond deposit and spread with a paddle or brush until the required thickness is obtained. Edges of drilled holes shall be coated with commercially available zinc-rich paint. Shop drawings will not be required for pipe posts.

The Contractor shall furnish to the Engineer, fabricators' certifications in triplicate certifying that the material supplied conforms to all of the requirements specified.

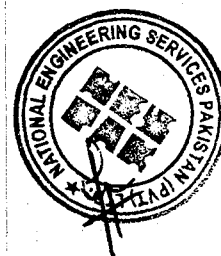
#### **614.2.12 Fastening Signs to Sign Posts**

Signs shall be fastened to sign supports in accordance with the requirements of the drawings, the recommendations of the sign manufacturer and to the satisfaction of the Engineer.

After installation of signs on their supports all bolt heads, screw heads, and washers which are exposed on the face of the sign shall be painted. The color of the paint used shall be as nearly as practical the same as the color of the background or message area at the point where the bolt, screw, or washer is exposed.

Where steel signs are mounted with aluminum hardware or on steel posts, approved asphalt, nylon, or neoprene insulation shall be installed at all points where dissimilar metals might come in contact.

#### **614.3 Erection of Delineators and Marker Posts**



Delineators shall be erected at locations shown on the drawings and set at elevations such that the Delineator reflectors will be at the indicated height above the ground surfaces. Unless otherwise noted in the Drawings or authorized by the Engineer's Representative, holes for posts shall be of the depth and size shown on the Drawings. Posts shall be set plumb and will be set to lines and grades as specified on the drawings. The cost of all excavation and concrete will be considered subsidiary to the bid item (s) for Delineators. Chevron shall also be installed on same pattern except using high density sheet for good reflection.

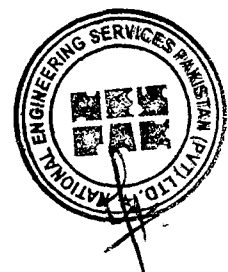
When noted on the Drawings or authorized by the Engineer's Representative, the posts shall be erected by driving, either by hand or with approved mechanical devices. The method of driving shall not substantially alter the cross-sectional dimensions of the posts or materially damage the coating. Battered tops will not be permitted. Posts which, in the opinion of the Engineer's Representative, are bent or otherwise damaged during or after erection shall be removed from the site and replaced at the Contractor's expense. After driving, the portion of the posts above ground shall be plumb and the posts shall be firm in the ground.

Reflectors shall be attached to the posts as indicated on the drawings or as directed by the Engineer or according to the manufacturer's specifications.

614.4

**PAYMENT**

Pay Item No.	Description	Unit of Measurement
SP-614	Delineators / Angle Reflector	Each



SP-615

**GANTRY SIGNS**



**615.1****GENERAL**

The work shall consist of supply, fabrication and installation of gantry signs at locations as shown on drawings or as directed by the Engineer as per the site requirement, complete in all respect. Gantry signs shall be required to be installed to provide the information about the important places and restriction enforced for type of passing vehicles.

The gantry signs shall be manufactured and installed in accordance with the details shown in the gantry sign's drawings and as directed and approved by the Engineer's representative. The sign panel shall be designed suiting the situation and approved by the Engineer's representative before its manufacture.

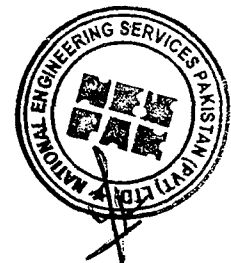
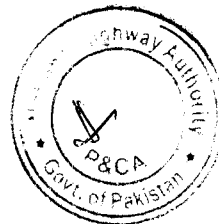
**Gantry Sign Structure**

The contractor shall be responsible to submit the complete methodology and shop drawings prior to the start of any activity and get approved from the Engineer representative. All work in respect of the furnishing, construction of foundation and erection and finishing of gantry sign structure shall conform to the drawings and to the relevant requirements of General Specifications section 401 "Concrete", section 404 "Steel Reinforcement", section 413 "Steel Structures and section 607 "traffic signs and safety devices" with amendments made in SP-504.

**615.2****MEASUREMENT AND PAYMENT**

The item shall be paid for as under, which price and payment shall be full compensation for all the costs necessary for the proper manufacture, installation and completion of work prescribed in the item/drawing:

Payment Item No.	Description	Unit of Measurement
SP-615a	Gantry Sign Type-I as shown on drawing	Each
SP-615b	Gantry Sign Type-II as shown on drawing	Each



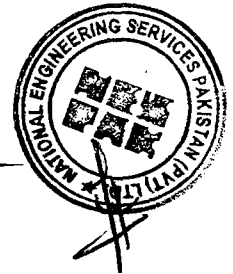
**415.1****SONIC INTEGRITY TESTS (SIT)**

All working piles shall be subjected to Sonic Integrity Testing (SIT) by a specialist agency engaged by the Contractor. The SIT equipment like FPDS (Foundation Pile Diagnostic System) or equivalent, as approved by the Engineer, shall be used for this purpose. The testing shall be done as per ASTM D5882-07. Before starting this testing, the Contractor shall submit his Method statement for approval of the Engineer.

The contractor shall arrange performance and interpretation of these tests by the specialist agency like TNO Netherlands or equivalent. The interpretation shall include information on pile length, concrete crushing strength, Sonic Pulse Velocity and defects like necking / honeycombing etc. A separate report shall be submitted for SIT carried out on piles by the Contractor.

**415.2****PAYMENT**

Item No.	Description	Unit of Measurement
SP-415	Sonic Integrity Tests (SIT) on all piles	Each

**SP- 418****GALVANIZED IRON DRAIN PIPE**

**418.1 DESCRIPTION**

The Contractor shall furnish and place galvanized iron drain pipe (AASHTO Standards M 1118-80 1986) in accordance with the plan of Bridge deck, specifications and/or as ordered by the Engineer.

**418.2 MATERIALS**

The Galvanized iron pipe shall conform to the requirements of ASTM Designation A120.

**418.3 CONSTRUCTION**

Where the pipe is used for bridge drains it shall be cast in the deck and shall be flush with the deck surface.

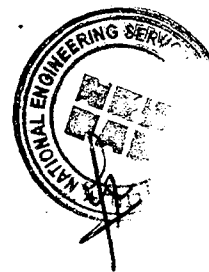
**418.4 MEASUREMENT**

The quantity to be paid for under this item will be number of linear meter of pipe incorporated in the work in accordance with the plans and specifications and as directed by the Engineer.

**418.5 PAYMENT**

The unit price bid per linear meter shall include the cost of furnishing and placement including all labor, materials and equipment necessary to complete the work.

Item No.	Description	Unit of Measurement
SP-418	GI drain pipe Dia 100 mm	M



**SP 701 PROVISIONS OF SURVEY TEAMS AND INSTRUMENTS**

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**701.1 DESCRIPTION**

The Contractor shall provide and maintain survey equipment for the sole use of the Engineer. All surveying equipment shall be new and shall be maintained throughout the Contract period and replaced by the Contractor free of charge in case of damage or loss. The survey equipment shall be supplied to the Engineer within thirty (30) calendar days from the Engineer's Order to Commence the Works.

Upon completion of the Contract, the surveying instruments and equipment shall become the property of the Employer and shall be handed over completely, and in a state of good, condition and working order taking into account fair wear and tear.

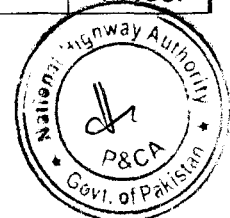
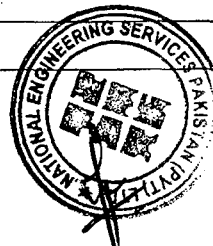
The Contractor shall provide adequate number of helpers, along with the equipment, to the Engineer/Engineer's Representative to assist in carrying out the field works.

701.2

### EXTENT OF PROVISION AND GENERAL REQUIREMENT

The Contractor shall provide and maintain at his own cost at least the following surveying equipment and any other surveying equipment deemed essential for the Work by the Engineer's Representative for the sole use of the Engineer's Representative:

Sr. No	Description	Quantity
1	<b>Electronic Total Station</b> 1" reading, 6" Accuracy, memory 10,000 points or more, Builtin. SD Card Slot & USB Port, programs topographic survey, setting out, curve Guide Light, Keyboard, Automatic Dual Axis Compensator working range $\pm 6'$ distance range reflector less 400 meter with single prism 5000 meter, with Triple Prism 6000 meters, one Balley & Quick Charger in Standard Accessories (Made in Japan or Equivalent).	1 Nos.
2	Software for Data Downloading.	1 No.
3	Single Prism Target Set includes: Prism, range pole graduated 2.6m., tilting mount with Coaxial Target Plate.	4 Nos.
4	Automatic Level, magnification 32X	2 Nos.
5	Levelling Staves with graduations in metric units	12 Nos.
6	Steel measuring tapes 30 m long	4 Nos.
7	Lockable Pocket tapes 5 m.	4 Nos.
8	TRIPOD (Aluminum)	5 Nos.
9	TRIPOD for Prism Pole	4 Nos.
10	Club hammers 2 kg.	4 Nos.
11	Sledge hammers 4 kg.	4 Nos.



12	Traffic Cones	40 Nos.
13	Survey Umbrellas	6 Nos.
14	Aluminum Straight Edges, 4 m long	2 Nos.
15	Aluminum Straight Edges, 5 m long	2 Nos.
16	Spirit Levels, 30cm long	4 Nos.

- All miscellaneous tools, equipment and materials required in surveying in numbers as determined by the Engineer's Representative.

All new surveying equipment shall be provided and maintained throughout the Contract period. In case of damage or loss those shall be replaced by the Contractor at his own cost.

The Contractor shall make available two (02) qualified surveyors and transport vehicle for checking and incorporation as and when required by the Engineer's Representative.

The survey equipment shall be placed at the disposal of the Engineer's Representative during the Contract period and shall be returned to the Employer on completion of the Contract, complete and in a good state, taking into account fair wear and tear.

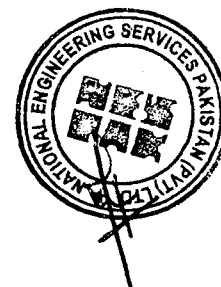
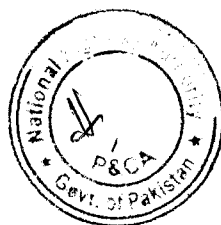
The Contractor shall provide adequate supplies of expendable materials i.e. level books, pencils, erasers inks, drawing papers, pegs, nails, flags, brushes and paints etc. as required by the Engineer's Representative.

### 701.3

### PAYMENT

The cost of supplying the equipment shall be paid as re-imbusement against provisional sum substantiated by vouchers from the owner plus twelve (12) percent surcharge to the contractor for administrative and overhead expenses including income tax (7.5%) related to the purchase and delivery of said items.

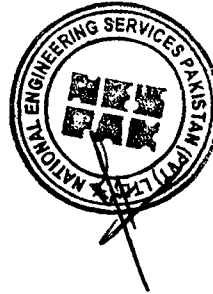
For running and maintenance, supporting staff, transport, stationery, utilities etc. shall be paid under maintenance of Surveyor Instrument.



Payment shall constitute full compensation for all costs of provision and maintenance of equipment, provision of vehicle, furnishing survey teams, supplies of expendable materials, necessary labor/helpers and all other incidental item(s) for the proper completion of the Work as stated herein

above and as directed by the Engineer's Representative:

Item No.	Description	Unit of Measurement
SP-701a	Provide Surveying and Allied Instruments.	P.S.
SP-701b	Maintain Survey Instruments, Including 2no. Helpers..	Month



**SP 702 PROVIDE EQUIP & FURNISH ENGINEER'S OFFICE & ACCOMODATION**

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**702.1 General**

The contractor shall provide a site office on rental basis against provisional sum provided in the Bill of Quantities. The site office includes the following:

- i) Office accommodation
- ii) Office furnishing and equipment
- iii) Office running and maintenance
- iv) Office supporting staff

**702.2 Engineer's Representative Office / Accommodation**

The office accommodation as approved and accepted by the Engineer shall be provided on rental basis. The overall size of the Engineer office shall be approximately 1000 Square. meters and residence accommodation of about 2,000 Square. meters having all kind of facilities.

**702.3 Furnishing & Equipment**

The furniture and equipment as approved and accepted by the Engineer shall be provided by the Contractor on the instructions of the Engineer or Representative of Engineer as per the requirement.

**702.4 Running and Maintenance**

702.4.1 The contractor shall be responsible for the running and maintenance of office accommodation, residence accommodation, furnishing and equipment etc. bills for all services/utilities to be paid by the contractor.

702.4.2 Office and Drawing Stationery and necessary equipment shall be provided by the contractor on monthly requirement basis as per the requirement or as directed by the Engineer.

**702.5 Supporting Staff**

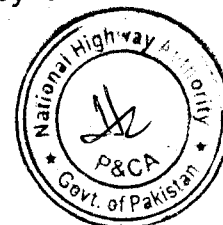
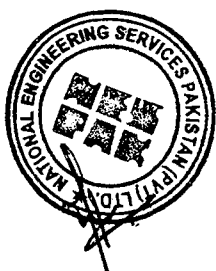
The contractor shall provide to the Engineer following supporting staff.

- i) Naib Qasid Two
- ii) Chowkidar Two
- iii) Cook Two and helper 02
- iv) Sweeper Two
- v) Guards Two

The appointment of the supporting staff shall be subject to the approval of the Engineer and once assigned shall not be transferred or laid off without prior approval of the Engineer.

In case of power failure and non-availability of power, electric power through generators shall also be provided by the contractor. All rooms shall be provided with standard office lighting of the flours cent type. All rooms shall have doors with locks and keys and supplied Air-conditioning and heating system as per the approval of the Engineer.

The water supply shall be maintained through water supply system of the town or locality boring/installing well with pump or by an elevated or pressure storage tank with a capacity of 2500 gallons.



A telephone shall be installed in Engineer's Office or cell phone may also be provided to facilitate the Engineer. Engineer office will be equipped with air-conditioning unit as per requirement.

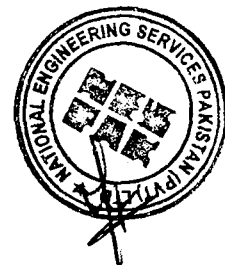
**702.6 Measurement and Payment**

For the hiring of accommodation for site office if approved & allowed by the Engineer, the cost of rent and supplying office furniture and Equipment shall be paid as re-imbusement against provisional sum substantiated by vouchers from the owner plus twelve (12) percent surcharge to the contractor for administrative and overhead expenses including income tax (7.5%) related to the purchase and delivery of said items.

For running and maintenance, office supporting staff, drawings, stationery, utilities bills etc. shall be paid under maintain of Engineer's office.

If the contractor does not provide necessary facility, Engineer shall hire the accommodation and arrange necessary supplies of furniture and equipment and employ staff etc. as specified and maintain the office. Expenditures shall be recovered from the IPC's / running bills of the contractor by adding hundred (100) percent overheads.

Pay Item No.	Description	Unit of Measurement
SP-702 a	Provide the Employer's and Engineer's Representative's Office and Residence (on rental basis)	Provisional Sum
SP-702 b	Furnish and Equip. the Employer's & Engineer's Representative Office and Residence	Provisional Sum
SP-702 c	Maintain Employer's and Engineer's Representative Office and Residence	Month



**SP 703 PROVIDE, EQUIP AND MAINTAIN LABORATORY FOR THE PROJECT**

**703.1 Description**

The work under this special provision shall be providing of three nos material testing laboratories on rental basis having minimum 500 Sq.m



covered area of each and shall be fully equipped with all necessary furnishing & equipment, utilities, installations and others as directed by the Engineer. Locations of material testing laboratories shall be as per approval / decision of the Engineer.

703.2

### **General Requirements**

The furnishing of equipment shall ensure conducting all tests related to construction as per the list provided by the Engineer. In case if any test required for testing of material cannot be performed in the project laboratory, the Engineer may authorize such test to be carried out at the cost of contractor, at any other laboratory. The Contractor shall provide at no cost to the Engineer, technicians, helpers and vehicles deemed necessary by the Engineer, to assist in the operation of the laboratories as required by the Contractor's proposed program of work. Technicians and helpers once assigned to the laboratories may be removed by the Contractor only with the approval of the Engineer and salaries shall be paid by the contractor. The equipment shall be procured within 15 days on the instructions of the Engineer.

The contractor shall maintain the laboratory equipment, apparatus and supplies necessary to permit execution of all standard test required by the specifications. Lists of specific laboratory equipment shall be provided as per the requirement and recommendation to purchase from recognized manufacturers. The Contractor shall submit to the Engineer for his approval at the earliest. The list shall include the manufacturer's name and descriptive literature. Lab Equipment, fixtures and furniture shall remain the property of the Employer after completion of the project.

703.3

### **Facility of the Material Testing**

Material testing equipment as described above shall be provided within minimum period. In case of delay in providing such facility, as an interim arrangement, temporary facilities of testing material shall be provided as agreed by the Engineer. Contractor may be paid for maintenance of temporary laboratory, provided such facilities are acceptable to the Engineer. Contractor shall also be responsible for extra expenses of the Engineer for conduction of test in temporary arrangement.

703.3.1

### **Supporting Staff**

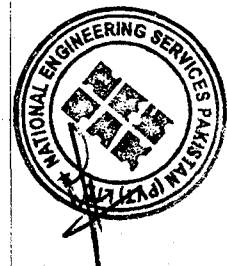
The contractor shall provide to the Engineer below mentioned supporting staff:

i)	Naib Qasid	One
ii)	Chowkidar	One
iii)	Cook	One
iv)	Sweeper	One

The appointment of the supporting staff shall be subject to the approval of the Engineer and once assigned shall not be transferred or laid off without the Engineer approval. Salaries shall be paid by the contractor.

703.4

### **Running and Maintenance**



703.4.1 The contractor shall be responsible for the running and maintenance of Laboratory, furnishing and equipment etc. bills for all services/utilities to be paid by the contractor.

703.4.2 Office and Drawing Stationery and necessary equipment & material shall be provided by the contractor on monthly requirement basis as directed by the Engineer.

**703.5 MEASUREMENT AND PAYMENT**

**703.5.1 Measurement**

Work under this item shall be measured in two portions.

- i) Hired the building for Material Testing Laboratory and purchase of laboratory equipment shall be paid as reimbursement against provisional sum substantiated by vouchers from the owner plus twelve (12) percent surcharge to the contractor for administrative, overhead expenses including income tax (7.5%) related to the purchase and delivery of said items.
- ii) For running / maintenance and office supporting staff, drawing stationery, Lab. Material/equipment (minor), utilities bills, helpers (06 nos.) etc. shall be paid under maintain base Laboratory. Maintain Laboratory, to be measured for the duration of the contract and paid as per the rate/month.

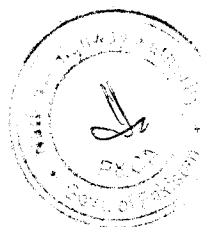
**703.6 Payment**

The quantities under this item of work shall be paid at the contract price indicated in the Bill of Quantities which price and payment shall constitute full compensation for all costs of furnishing labor, materials, equipment and incidentals for the proper completion of the work indicated in these specifications and specified on the drawings and Special Provisions (Specification).

Pay Item No.	Description	Unit of Measurement
SP- 703 a	Provide Material Testing Project Laboratory (01 No rental basis)	Provisional Sum
SP- 703 b	Equip and Furnish Material Testing Project Laboratory	Provisional Sum
SP- 703 c	Maintain Material Testing Project Laboratory 01 Nos including 04 No Helpers	Month

**SP 708 PROVIDE, RUN AND MAINTAIN TRANSPORT FOR EMPLOYER / ENGINEER'S REPRESENTATIVE**

**708.1 General**



The transport for the Employer's / Engineer's Representative and site staff is to be provided under this Contract for which provisional sum and rate item has been provided in the B.O.Q. Contractor shall procure these vehicles under the instruction of the Engineer.

#### **Procurement of Vehicles**

The contractor shall procure the vehicles from the local market, get these registered in the name of the Employer and hand over to the Employer's and Engineer's Representative.

Details /Type of vehicles are as under:

- SP-708a : One (01) No vehicles for the Employer representatives  
(Type of vehicle will be as per the directions of Employer)
- SP-708b : Five (05) Nos. vehicles for the Engineer's representatives
- (i) 4x4 Double Cabin 2800cc (1 No.)
  - (ii) Car 1600 cc (02 Nos)
  - (iii) MPV 800cc (02 Nos)

The number of vehicles (6 nos.) covered under this provision shall be new/ latest model at the time of delivery when instructions to procure these vehicles is given as per approval of the Engineer. The vehicles shall be handed over to Employer / Engineer's Representative. The Contractor shall be responsible for the cost of running & maintenance. These vehicles shall remain the property of the Employer and shall be handed over to the Employer after completion of the work in good working condition. The cost of vehicle shall be inclusive all like purchase, transportation, registration and other dues incurred in this regard. In case new vehicles are not purchased, same numbers of road worthy conditions vehicles shall be hired and its rent cost shall be paid through pay item SP-708a, rental cost shall be approved by the Employer.

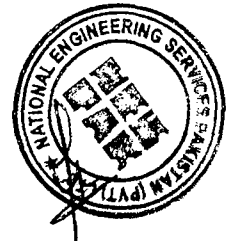
In case of delay, failure or default on the part of the Contractor in providing the facilities under these provisions, the Engineer's Representative may arrange the same at the risk and cost of the Contractor or hired the vehicles such period.

#### **708.2 Running & Maintenance**

The Contractor shall be responsible for the running and maintenance of these vehicles which includes petrol, diesel, repair works, regular tuning, replacement of tires, registration, comprehensive insurance, annual renewal, lubricants, servicing including providing drivers etc.

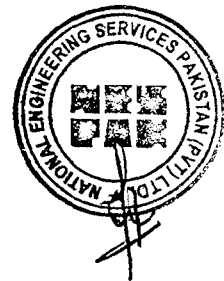
#### **708.3 Method of Payment**

On the instructions and determination by the Engineer, Contractor shall be paid for the Services under this Clause as follows:-



- i) For the procurement of vehicles Contractor shall provide the original supporting vouchers/receipts for his billing which shall be paid from the provisional sum with 10% extra cost as handling charges and income tax. In addition to that contractor shall also be paid applicable levies & other taxes but not the income tax (7.5 %) (If applicable).
- ii) For running and maintenance of above vehicles including salaries of drivers, the Contractor shall be paid on monthly basis.
- iii) On failure of the contractor to provide and of the services under this clause or even otherwise notwithstanding anything contained in any other clauses of the Contract Documents, the "Engineer" shall have the authority to nominate/sublet to any other contracting agency on recommendation of the Resident Engineer for the supply of services under this clause, the payment for which shall be made through this contract direct to the nominated agency out of Provisional Sum provided in the Contract or hire the good road worthy vehicles and recover the cost with 100% penalty charges from contractor's IPC's.

Item No.	Description	Unit of Measurement
SP-708a	Provide Employer's Representative Transport (01 Nos.)	PS
SP-708b	Provide Engineer's Representative Transport	
	(i) 4x4 Double Cabin 2800cc (1 No.)	Each
	(ii) Car 1600 cc (02 Nos)	Each
	(iii) MPV 800cc (02 Nos)	Each
SP-708c	Running & Maintenance of Employer's/Engineer's Representative Transport	Vehicle-Month



SP-715

**EMPLOYING TRAINEE ENGINEER's WITH BOARDING, LODGING AND MESSING**

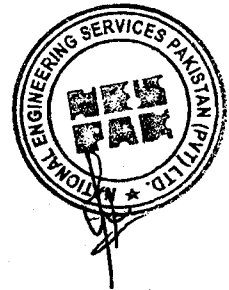
The contractor will employ Trainee Engineers after the approval of the Employer, throughout the duration as per the contract and BOQ. Each

Trainee Engineer will be given a monthly stipend Rs. 50,000 (minimum) by the contractor. The period of training of each trainee will be as per the contract. The Contractor will prepare a comprehensive training program and get it approved from NHA. It will be the contractor's responsibility for the provision of boarding & lodging of each Trainee Engineer or paid separately its cost.

**Measurement and Payment**

The number of Trainee Engineers shall be counted and paid to contractor as per the contract unit price which includes full compensation for all costs necessary like monthly stipend, boarding, lodging and transport facility.

Item No.	Description	Unit of Measurement
SP-715	Employing Trainee Engineer's With Boarding, Lodging And Messing	Man-Month



**ISLAMIC REPUBLIC OF PAKISTAN  
NATIONAL HIGHWAY AUTHORITY**



**OCB/CAREC/T-III:**

**Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 KM) from Two-Lane to Four-Lane Under one Package Comprising of Four Lots**

- *Lot-3: DG Khan to Tibi Qaisrani via Shahdan Lund Section (111.70 Km)*

**PARTICULAR SPECIFICATION/  
SPECIAL PROVISIONS**



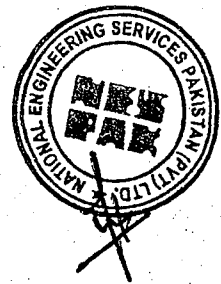
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Item 201	Granular Subbase
Item 202	Aggregate Base Course
Item 203	Asphaltic Base Course (hot plant mix)
Item 305	Asphalt Wearing Course – hot plant mix
Item 401	Concrete

## 2. Special provision

SP -117a	Formation of granular material platform
SP -117b	Formation of Earthen dowels
SP- 414	Soil Investigations at Bridge Sites
SP- 415	Sonic Integrity Tests (SIT) on all Piles
SP- 416	Manufactured Trade Marks expansion joints
SP- 417	Bitumen Coating
SP- 418	Galvanized Iron Drain Pipe
SP- 419	Steel Grating / Gully Grating Chamber
SP- 614	Delineators / Angle Reflectors
SP- 615	Gantry Signs
SP - 701	Provisions of survey teams and instruments
SP - 702	Provide equip & furnish engineer's office & accommodation
SP- 703	Provide, equip and maintain laboratory for the project
SP - 708	Provide, running and maintain transport for employer / Engineer's representative
SP - 715	Employing Trainee Engineer's with Boarding, Lodging & Messing
SP - 800	Electrical Works
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SP - 802	Luminaries
SP - 803	Conduits & Pipes
SP - 804	LV Cables
SP - 805	Lighting Control Panel
SP - 806	Earthing



# Particular Specifications





# NATIONAL HIGHWAY AUTHORITY

## CONSTRUCTION OF D.G KHAN D.I KHAN SECTION OF N-55 (208.19 KM) SECTION-2, PACKAGE-1 (KM. 121+500 TO KM. 233+200)

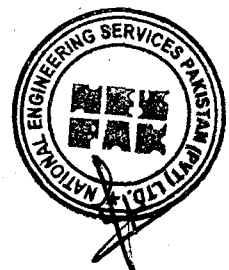
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- Item 109 Subgrade Preparation
- Item 201 Granular Subbase
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- Item 305 Asphalt Wearing Course – hot plant mix
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- SP- 416 Manufactured Trade Marks expansion joints
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- SP - 803 Conduits & Pipes
- SP - 804 LV Cables
- SP - 805 Lighting Control Panel
- SP - 806 Earthing



# Particular Specifications



**ITEM 107 STRUCTURAL EXCAVATION AND BACKFILL**

**107.1 DESCRIPTION**

In line 12, add at the end:

This includes excavation below original ground and back filling with granular or select fill. All common backfilling above the level of the original ground shall be payable under Item 108.

Delete 107.2.1, 107.2.2 and replace with the following.

**107.2.1 Backfill around Structure**

Backfill around or below structure shall be made with the following material.

- a) Granular backfill / Select Fill material as specified hereunder
- b) Common backfill shall be carried out from excavated material or any other borrow material approved by the Engineer.

**107.2.2 Granular backfill/Select Fill**

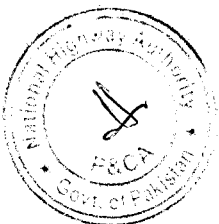
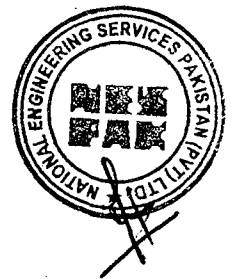
Granular backfill/Select fill material shall meet the following requirements:

a) **Grading Requirement**

mm.	inch	% passing
25	1"	100
19	¾"	60-100
4.75	No. 4	50-80
2.0	No. 10	40-70
0.425	No. 40	25-45
0.075	No. 200	0-15

Material satisfying the requirements of coarse sand falling under soil classification A-3 (AASHTO). In case, coarse sand is utilized for granular fill it shall be ensured that the same is confined properly with approved material.

- b) The material shall have a Plasticity Index of not more than six (6) as determined by AASHTO T-89 and T-90



iv) (a) Placement of Select Fill

All vegetation, topsoil and other unsuitable materials shall be removed. Prior to placement of the first layer of select fill, the ground surface shall be compacted as given in Section 104.2.

(b) Compaction of Select Fill

The select fill material shall be placed in layers of thickness appropriate to the type of compaction equipment and compacted to meet the following minimum requirements of compaction at OMC (-2%) to + 1 % of OMC):

- 95 % M.D.D as per AASHTO T 180 or
- 74 % Relative Density as per ASTM-D 4253/4254.

f) Pumping

Add the following in the beginning

Care shall be taken during excavation to prevent disturbance to the foundation. If ground water is encountered during excavation and a concrete seal course is not to be used, dewatering shall be commenced and shall proceed in advance of or concurrently with further excavation. The foundation shall be free of water at the time, footing concrete is placed and water control shall continue as necessary to prevent damage to the work.

All dewatering shall be performed at the Contractor's sole expense and shall be considered as included in the contract unit price(s) for the facility being constructed. The sides of excavations shall be sloped as required by soil conditions to stabilize the sides for safe working conditions. The quantities of excavations for said sloping will not be measured for payment. The backfilling shall be done with suitable materials as approved by the Engineer, at Contractor's expense.

h) Classification of Excavation

Delete the whole paragraph

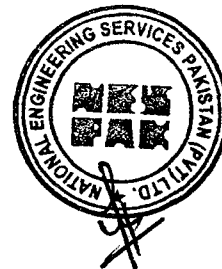
107.3.2 Excavation in Embankments

In para 3, line 3, delete "also" and substitute with "Also"

107.3.3 Backfill

Add the following para at the end:

Any temporary backfill or platform constructed by the Contractor for piling purposes or any other work item(s), its preparation, construction and removal



**107.2.3 Common Backfill**

In line 3, add after "Engineer" "as per the material requirements in Section 108.2".

Add Subsection 107.2.5

**107.2.5 Requirement of Select Fill Material Below Structures' Foundations**

Requirement of Select Fill material below structures' foundations shall be as per 107.2 or as directed in writing by the Engineer.

**107.3 CONSTRUCTION REQUIREMENTS**

**107.3.1 Structural Excavation**

a) General

Delete para 3, and add the following:

"The Contractor shall notify to the Engineer well in advance about the start of any structural excavation which constitute a pay item in the Bill of Quantities. The Engineer shall observe the cross-sectional elevations and measurements taken for the existing ground in the area of the structure. Any material removed or excavated before these measurements and approved by the Engineer will not be paid.

The Contractor shall minimize, to the extent possible, the length of time that excavated areas are open. He shall be solely responsible for damages due to weather, equipment, accidents, or other causes when excavation is left open. In this regard the Contractor shall take all required precautionary measures such as barriers, barricades and warning signs etc.

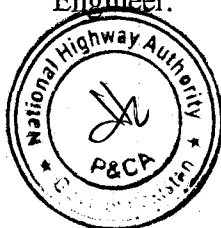
d) Preparation of Foundations of Footings

In para (ii), line 2, delete "special, care" and replace with, "special care".

At the end, add para (iii) and (iv) as follows:

iii) Foundation material on which structure is to be placed shall be compacted as per clause 107.3.3 unless otherwise directed by the Engineer.

In case unsuitable material (as per clause 108.2e) is encountered at foundation level shall be removed to the depth and extent as directed and replaced with suitable material of the type as determined by the Engineer.



of this work by the Contractor shall not be measured for payment. Its cost shall be deemed included in the respective pay item.

**107.4 MEASUREMENT AND PAYMENT**

**107.4.1 Measurement**

a) Structural Excavation

In para 1, line 2, between "position" and "computed" insert "below top soil"

Add at the end of para (1) the following:

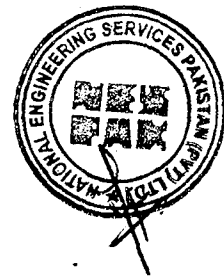
However the stability of the structural excavation shall be the responsibility of the Contractor for which he may use any appropriate means including shoring and / or excavation along a suitable slope line without any extra payment.

In para 3, sub-para (1), add at the end:

"Neat lines of footings or foundations shall mean the outer faces of footings or foundations excluding lean concrete.

After para 4, at the end, add the following para:

"No separate payment shall be made for compaction of excavated foundation under structures".



## ITEM 108 FORMATION OF EMBANKMENT

### 108.1 DESCRIPTION

Add at the end of para.

The work shall also include the compaction, trimming and shaping of the side slopes as shown on the plans and removal of any excess fill as directed by the Engineer prior to placement of top soil on slopes of the embankment where required.

### 108.2 MATERIAL REQUIREMENTS

Add the following at the end of 1<sup>st</sup> para.

Wet excavated material which will be suitable when dry and if approved by the Engineer shall first be allowed to dry before being placed in the embankment. If the Contractor wishes to replace the wet (suitable) material with dry material that can be easily compacted to the required density to save his time, the same shall be done at no extra cost to the employer.

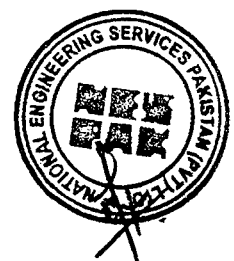
b) Delete and replace with following table;

CBR of the material with regard to depth of embankment shall be as follows

Depth of Embankment	CBR at 95% MDD
0 – 30 cm	25%
Below 30 cm	7%

Add after (d)

- e) In case non-cohesive material is used for embankment formation, it shall be properly confined at no extra cost, with a cohesive material having Liquid Limit not more than 25 and Plasticity Index not more than 6 or as approved by the Engineer.
- f) For the purpose of embankment and subgrade construction the following shall be considered as unsuitable materials:
- 1) AASHTO soil classification group of A6 and A7;
  - 2) Material from swamps, marshes and bogs;
  - 3) Peat, logs, stumps, garbage and perishable materials;
  - 4) Material susceptible to spontaneous combustion;
  - 5) Organic Soils, as determined by ASTM D 2487-83 or USBR Earth Manual.



- f) The moisture content of the soil at the time of compaction shall be optimum to achieve the compaction up to the specified density. The maximum dry density and optimum moisture content shall be determined from moisture density test (AASHTO T-180 Method D) performed on different type of soil to be used in the construction of the work. Optimum moisture content and the moisture range required for the soil to achieve the desired compaction shall be approved by the Engineer. The soil shall be compacted at optimum moisture content with +1 % to -2 % tolerances, commensurate with the soil type, unless otherwise directed by the Engineer.

When compaction is determined by "Relative Density Test" then tolerance for moisture content shall be finalized during the compaction trial and approved by the Engineer.

### 108.3 CONSTRUCTION REQUIREMENTS

#### 108.3.1 Formation of Embankment with Borrow Common Material

After 1<sup>st</sup> para add following:

If suitable material is not available in the Project area, the Contractor shall blend granular material with locally available soils which are otherwise unsuitable (as per category 1 of 108.2e), to achieve a uniform blend that meets the material requirements stated above without any additional cost to the Employer. Such widely divergent materials may be mixed, sampled and tested outside the embankment limits and the mixture may be used as a proposed source of borrow material as outlined in Section 108.2. However, the Contractor will submit his method statement to the Engineer and get it approved before proceeding with the work. Approval of this method statement by the Engineer shall not relieve the Contractor of his responsibility to use the suitable material in the Works. Material for embankment, obtained and approved as provided above, shall be placed in horizontal layers of uniform thickness and in conformity with the lines, grades, sections and dimensions shown on the Drawings or as required by the Engineer. The layers of loose material other than rock shall be not more than 20 cm. thick, unless otherwise allowed by the Engineer after a trial section is prepared and approved for each material source and/or borrow area.

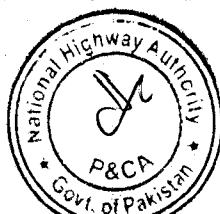
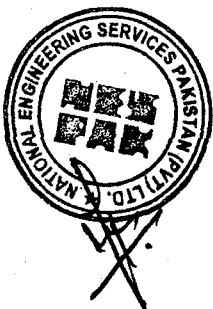
Delete para 7

Delete last para and replace it with the following:

Side slopes shall be neatly trimmed to the lines and slopes shown on the drawings or as directed by the Engineer, and the finished work shall be left in a neat and acceptable condition. The slopes of the design road cross-section shall be trimmed and compacted to the densities as specified above for different zones". No surplus material shall be permitted to be left at the toe of embankment or at the top of cut section.

#### Relative Density Test

For cohesion-less free-draining soils for which impact compaction will not produce a well-defined moisture density relationship curve and the maximum density, Test





At the end of clause 108.3.5 add the following:

When the roadway profile is so low that after construction of the lower part of the embankment using a "bridging lift" will not permit the placement and compaction of fifty (50) centimeters of acceptable embankment material, Contractor shall prepare a proposal to raise profile of the embankment and submit it to the Engineer for his approval.

Boulders and rock fragments larger than twenty (20) centimeters in maximum dimension shall not be placed in the embankment any closer than fifty (50) centimeters from top of the subgrade.

Embankment settlement period for critical section, where height is greater than 5.0 meter, is approximately three (3) months. Embankment therefore, shall remain in place for the required settlement period before placing the 30 cm thick subgrade layer.

### **108.3.6 General Requirements**

At the end add the following:

Embankment filling shall be brought up and compacted over the full width of the embankment of the carriageways in one operation in layers parallel with the sub-grade level. At no time shall any part of the embankment width under one carriageway be left more than one layer lower than any other part of the embankment width.

Shoulder construction shall be brought up simultaneously with the pavement construction. In order to prevent water penetration into the pavement layers during construction, shoulder and median construction shall be brought up simultaneously with the pavement construction.

Embankment side slopes shall be neatly trimmed to the lines and slopes shown on the drawings or as directed by the Engineer and the finished work shall be left in a neat and acceptable condition.

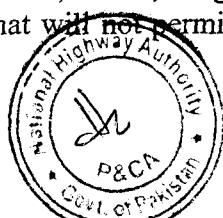
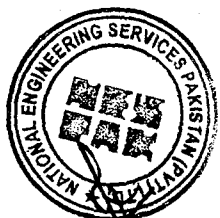
### **108.3.7 Formation of Embankment with A-3 Material**

The construction of embankments with A-3 material shall be accomplished as shown on the plans, specified in Particular Specifications and Special Provisions or as directed by the Engineer. Construction of embankment with A-3 material shall be carried out in a series of operations as follows:

Edge berms shall first be constructed along both sides of the staked embankment, except where the embankment is to be constructed against hillsides or existing embankment, using Class A-1, A-2 or A-2-4 soils from roadway excavation or borrow or any other source which can resist erosion by wind and water and are approved by the Engineer. However, if Engineer so approved A-4 material having PI value 4-8 from borrow excavation can be used for confinement. Edge berms shall be constructed with an external side slope as shown on the plans or specified in these Particular Specifications and Special Provisions, but not steeper than one (1) vertical to three (3) horizontal. Edge berms shall be constructed not more than thirty (30) centimeters in height w.r.t A-3 embankment and not less than 2.0 meters wide at the top. The materials shall be placed and spread in layers as specified in these Specifications and compacted as specified in Table 108.3.1.

### **108.3.8 Formation of Embankment on Existing Structures**

When an embankment surface is to be constructed over an area previously occupied by a building basement, cellar, irrigation canal, well, any previous excavation, or other such construction that will not permit the use of normal compaction equipment, the embankment



for Relative density of Cohesion-less soils ASTM D-4253/4254 shall be used to determine the relative density.

Relative density is defined as the state of compactness of a soil with respect to the loosest and densest state at which it can be placed by the laboratory procedures described in the ASTM D-4253/4254. The field Density and actual Moisture Content of the compacted embankment shall be determined by field tests according to AASHTO T 191.

### 108.3.5 Formation of Embankment in Water Logged Areas

Delete 1<sup>st</sup> and 2<sup>nd</sup> paras and replace with the following:

In places where excessive moisture is encountered in natural ground and movement of heavy machinery is not possible as it creates soft spots and movement in ground, all such areas shall be left undisturbed for such period that the top surface dries up and forms a crust. The Contractor shall prepare a moisture profile up to a depth of 1.5 meters.

A blanket layer of 60 cm or more (up to one (01) meter) shall be placed in two lifts in the following manner:

- Material stocked at one end of the subject area.
- The material is then pushed by dozer making a lift of 30 cm. (or half the thickness of total lift)
- The dozer should only move on the spread material making sure that no machinery shall move on natural ground.
- After completing one stretch, the area is proof rolled. Material for 2<sup>nd</sup> lift is again stocked at one end and pushed by dozer in the similar manner as 1<sup>st</sup> lift.
- After completing the 2<sup>nd</sup> lift, the top 15 cm is compacted to 90% of maximum dry density.
- Vibration of roller shall not be allowed on blanket layer in any case.
- After approval of this layer, further filling shall be carried out as per standard procedure of 15 cm compacted layer.

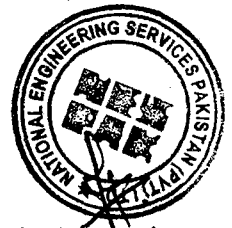
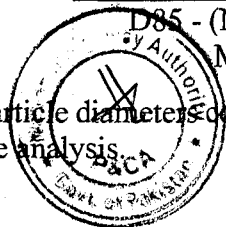
The material of blanket layer/working platform shall be as per clause 108.2 (d) and paid under item 108 c.

It should also be checked that selected grading is such that intrusion into the blanket/working platform material of sub-grade or natural ground surface material is not allowed.

For this condition to be met it will be required that the ratio as below shall be checked and followed:

$$\frac{D15 - (\text{Granular Fill Material})}{D85 - (\text{Natural Ground Material})} < 5$$

D15 and D85 mean the particle diameters corresponding to 15% and 85% respectively, passing (by weight) in a grain size analysis.



construction shall conform to the backfilling requirements specified in Structural Backfilling in these Specifications, until the normal compaction equipment can be used. The material shall be compacted to the density specified for the adjacent embankments.

**108.3.9 Trial Section**

Before starting the filling of the embankment, the Contractor shall construct trial sections of minimum 200 meters and maximum of 500 meters or as directed by the Engineer with each soil type / source proposed to be used as fill material. The soils used in the trials shall be the same as those intended to be used for the formation of embankment and the compacting equipment shall be the same that the Contractor will use for the main work.

The construction of embankment with any type of soil / material source shall be subject to written approval of the Engineer after the trial section made for that particular type of soil/material source.

The objective of these trials shall be to determine the optimum moisture content and the relationship between the number of passes of compacting equipment and density obtained for the soil types under trial and for the verification of the soil type itself. No separate payment will be made for this work, which shall be required as a subsidiary obligation of the Contractor under Pay Item Nos. 108a, 108b or 108c, as the case may be. The Engineer may order additional compaction test sections when deems necessary.

**108.4.1 Measurement**

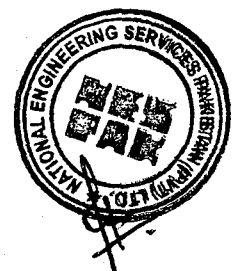
**iii) Formation from Roadway Excavation**

In para 1, last line, delete "&108b"

**108.4.2 Payment**

Replace the table as under:

Pay Item No.	Description	Units of Measurement
108a	Formation of Embankment from Roadway Excavation in Common Material	CM
108c	Formation of Embankment from Borrow Excavation in Common Material	CM
108d	Formation of Embankment from Structural Excavation	CM



## ITEM 109 SUBGRADE PREPARATIONS

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### 109.2.3 Subgrade Preparation in Earth Cut

Delete para one and two and replace with the following:

In case bottom of subgrade level is within thirty (30) cm of the natural ground, the top  $\leq$  fifteen (15) cm material shall be removed and stockpiled at a nearby location. The exposed surface shall then be scarified, broken up, adjusted to optimum moisture content and compacted to minimum density of ninety five (95) percent of the maximum dry density as determined by AASHTO T-180 Method D. Second layer of sub-grade shall then be prepared by incorporating the above mentioned stockpiled material to ensure that the depth of sub-grade layer is thirty (30) cm.

In case, the bottom of sub-grade is below the natural ground by more than thirty (30) cm, the material above the top of sub-grade shall be removed and subsequent layer of thirty (30) cm shall be prepared in two layers as per the method describe above.

At the end add the following:

Subgrade of thirty (30) cm. shall in any case be prepared and compacted in two layers of fifteen (15) cm. each.

### 109.2.8 Protection of Completed Work

Add at the end:

It will be at discretion of the Engineer to check some or all such reaches for compaction and moisture content before placing the next layer.

### 109.2.9 Templates and Straightedges

Delete and replace by following:

The Contractor shall provide for the use of the Engineer, satisfactory templates and straightedges in sufficient numbers to check the accuracy of the work, as provided in these specifications and no subsequent work shall be permitted until the sub-grade levels have been checked and approved by the Engineer.

### 109.2.10 Finishing Tolerances and Requirements

Quality Assurance measuring or testing shall involve verification that the sub-grade is constructed, timely finished and trimmed in a neat, workmanlike manner to the lines, grades and typical cross sections shown on the Plans or staked by the Engineer within the required tolerances.



**201.3 CONSTRUCTION REQUIREMENTS**

**201.3.5 Moisture Content Determination**

Delete para (b).

Same size of sample should be placed in oven for moisture determination in case of laboratory density (Proctor) and field density to ensure compatible compaction results.

Add at the end:

**201.3.7 Protection of Completed Work**

Any part of the sub-base that has been completed shall be protected and kept well drained. Any damage resulting from carelessness of the Contractor shall be repaired as directed by the Engineer without additional payment.

The Contractor shall be responsible for all the consequences of traffic being allowed to ply on the sub-base. He shall repair any ruts or ridges occasioned by his own traffic or that of others by reshaping and compacting with rollers of the size and type necessary for such repair. He shall limit the area of sub-base preparation to an area easily maintained with the equipment available. Sub-base preparation and placing of aggregate base course shall be arranged to follow each other closely. The sub-base, when prepared too soon in relation to the placing of the aggregate base course, is liable to deteriorate, and in such case the Contractor shall, without additional payment, repair, reroll, or re-compact the sub-base as may be necessary to restore it to the state specified herein.

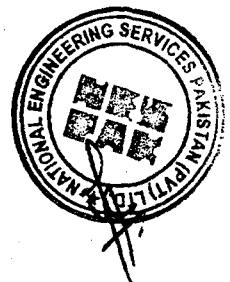
It will be at discretion of the Engineer to check some or all such reaches for compaction, moisture content and surface irregularities before placing the next layer.

**201.4 MEASUREMENT AND PAYMENT**

**201.4.2 Payment**

Replace the table of Pay Items by the following:

<b>Pay Item No.</b>	<b>Description</b>	<b>Unit of Measurement</b>
201a	Granular Sub-base (Crushed Aggregate)	CM
201b	Re-use of Broken / Salvaged Granular Material from existing road as Sub-base	CM



D60/D10 shall be greater than four (4).

- b) The material passing the 19 mm sieve shall have a CBR value of minimum eighty (80) percent, tested according to the AASHTO T-193 / ASTM D-1883. The CBR value shall be obtained at the maximum dry density determined according to AASHTO T 180, Method D.
- c) The Coarse aggregate shall have a percentage of wear by the Loss Angeles Abrasion test (AASHTO T-96) of not more than forty percent (40%).
- d) The fraction passing the No. 200 sieve shall not be greater than two third of the fraction passing the 0.425 mm (No 40) sieve.
- e) The portion of filler, including any blended material, passing No. 40 mesh sieve shall have a liquid limit not more than 25 and a plasticity index not more than 6 as per AASHTO T 89 & T 90
- f) The sand equivalent determined according to AASHTO T-176 shall not be less than 45.
- g) Crushed Aggregate (material retained on sieve No. 4) shall consist of material of which hundred (100) percent by weight shall be crushed particles having a minimum one fractured face and at least ninety (90) percent by weight shall be crushed particles, having a minimum of two (2) fractured faces.
- h) The material shall have a loss of less than twelve (12) percent when subjected to five cycles of the Sodium Sulphate Soundness test according to AASHTO T-104.
- i) Flat, elongated, soft and disintegrated pieces shall not exceed 10 % of total volume of Crushed Aggregate Base Course.
- j) Friable particles tested according to AASHTO T-112 shall not exceed 0.25 %.

#### 202.2.1 Filler for Blending

In the table change Plasticity Index value from "6 maximum" to "4 maximum" and Sand Equivalent value from "30 minimum" to "45 minimum"

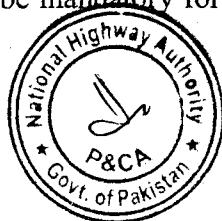
#### 202.3 CONSTRUCTION REQUIREMENTS

Delete this Section completely and replace as follows:

##### 202.3.1 Mixing of Aggregate Material

Mixing of different sizes of aggregate and stone dust shall be mixed in the central mixing plant/pug-mill at proper moisture content. Mixing at site or over prepared sub-base shall not be allowed in any case.

It shall be mandatory for the Contractor to lay aggregate base course in specified



## ITEM 202 AGGREGATE BASE COURSE

### 2.2.2 MATERIAL REQUIREMENTS

Delete this Section completely and replace as follows:

Material for crushed aggregate base course shall consist of crushed hard durable gravel, rock or stone fragments. It shall be clean and free from organic matters, lumps of clay and other deleterious substances. The material shall be of such a nature that it can be compacted readily under watering and rolling to form a firm and stable base for both flexible and rigid pavements.

The aggregate base shall comply with the following grading and quality requirements.

- a) The gradation curve of the material shall be smooth, well graded and within the specified allowable tolerances and the envelope.

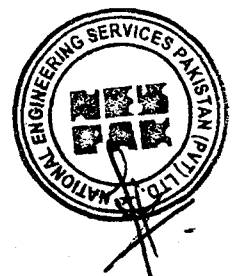
The grading table as per ASTM D 2940 given below:

Grading Requirements for Crushed Aggregate Base Material		
Sieve Designation		Mass Percent Passing Grading
mm	Inch	
50.0	(2)	100
37.5	(1.5)	95-100
19.0	(3/4)	70-92
9.5	(3/8)	50-70
4.75	No. 4	35-55
0.600	No. 30	12-25
0.075	No. 200	0-8

The final gradation decided within the limit designated in the table shall be all graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieves or vice versa.

This material shall be obtained by mechanically crushing the material retained on 3" size sieve.

The material shall be well graded so that the coefficient of Uniformity



thickness, line and grade on approved surface using mechanical paver. Dumping the aggregate base material on prepared sub-base and spreading with motor grader will not be allowed. The paver shall be power propelled unit, provided with automatically controlled screeds and feed controls capable of spreading the aggregates and maintaining specified thickness and grade. The paver shall be equipped with receiving hoppers having sufficient capacity for a uniform paving operation. The paver shall be operated at a constant speed to give best results. The mechanical paver has to be approved by the Engineer's Representative prior to start of paving activity.

### **202.3.2 Preparation of Surface for Crushed Aggregate Base Course**

In case crushed aggregate base is to be laid over approved sub-base course, the sub-base course shall not have loose material or dried / over moist condition w.r.t optimum moisture content.

### **202.3.3 Compaction Process**

Compaction process shall conform in all respect to the requirements specified under this heading in Item 201 (201.3.3).

### **202.3.4 Compaction Requirement**

The relative compaction of each layer of the compacted base shall not be less than 100 percent of the maximum dry density determined according to AASHTO T-180, Method D after adjustment of coarse particles obtained during field density test (retained on 19 mm sieve or 4.75 mm sieve whichever is applicable) as per AASHTO Method T-224. The field density shall be determined according to AASHTO T-191.

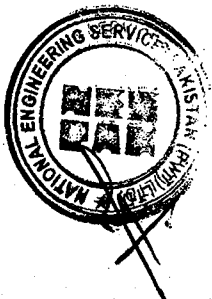
Completed base course shall be maintained in an acceptable condition at all times until prime coat is applied. When base course is to carry traffic for an indefinite length of time before receiving surfacing, the Contractor shall maintain the surface until final acceptance and shall prevent reveling by wetting, blading, rolling and addition of fines as may be required to keep the base tightly bound and leave a slight excess of material over the entire surface which must be removed and the surface finish restored before application of prime coat.

### **202.3.5 Moisture Content Determination**

Moisture content determination shall conform in all respects to the requirements specified under clause 201.3.5 for sub-base.

### **202.3.6 Trial Sections**

Prior to commencement of crushed aggregate base course operations, a trial section of two hundred (200) meters minimum, but not to exceed five hundred (500) meters shall be prepared by the Contractor using same material and equipment as will be used at site to determine the adequacy of equipment, loose depth measurement necessary to result in the specified compacted layer depths,





field moisture content, and relationship between the number of compaction passes and the resulting density of material.

### 202.3.7 Surface Tolerance

Grade control shall be accomplished by means of grade stakes, steel pins or forms, placed in lanes parallel to the centerline of the road and at intervals sufficiently close to permit placing of string lines or straightedges for checking purposes.

The surface layer of the crushed aggregate base course shall be evaluated for compliance with the following surface tolerances:

- a) The cross section of the finished aggregate base surface shall be checked by the Contractor in the presence of the Engineer at maximum intervals of twenty-five (25) meters and at intermediate points as directed by the Engineer.
- b) The allowable tolerances in design elevation of the finished base are stated in "Table for Allowable Tolerances" in these Specifications.

Isolated deviations below the design elevation shall be compensated by additional thickness of the subsequent pavement layer. Additional cost and materials resulting from deviations from the design elevation shall be borne by the Contractor.

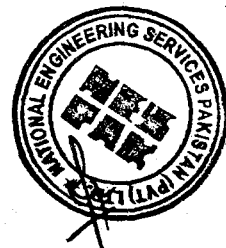
### 202.3.8 Acceptance, Sampling and Testing

Acceptance of sampling and testing with respect to materials and construction requirements shall be governed by the relevant, "Table for Sampling and Testing Frequency" or as approved by the Engineer.

### 202.3.9 Protection of Completed Work

Any part of the aggregate base course that has been completed shall be protected and kept well drained. Any damage resulting from carelessness of the Contractor shall be repaired as directed by the Engineer without additional payment.

The Contractor shall be responsible for all the consequences of traffic being allowed to ply on the aggregate base course. He shall repair any ruts or ridges occasioned by his own traffic or that of others by reshaping and compacting with rollers of the size and type necessary for such repair. He shall limit the area of aggregate base course preparation to an area easily maintained with the equipment available. Aggregate base course preparation and placing of asphalt base course shall be arranged to follow each other closely. The aggregate base course, when prepared too soon in relation to the placing of the asphalt base course, is liable to deteriorate, and in such case the Contractor shall, without additional payment, repair, reroll, or re-compact the aggregate base course as may be necessary to restore it to the state specified herein.

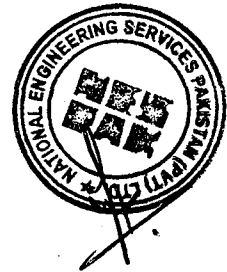


It will be at discretion of the Engineer to check some or all such reaches for compaction, moisture content and surface irregularities before placing the next layer.

**202.4.2 Payment**

Replace the pay Item table as follows:

Pay Item No.	Description	Unit of Measurement
202	Aggregate Base Course (Mixing in Central mixing Plant/ Pugmill and Laid with Mechanical paver)	CM



## **ITEM 203 ASPHALTIC BASE COURSE (HOT PLANT MIX)**

Delete the entire item and replace it by the following:

### **203.1 DESCRIPTION**

This work shall consist of furnishing plant, labor, equipment, materials, mixing aggregates and asphalt binder and additive material (where required) at a central batch asphalt mixing plant, to a specified temperature, hauling, including loading unloading, laying and compacting the mixture on an approved primed sub-grade, sub-base or base course in accordance with these Specifications and in conformity with the lines grades and typical cross-sections shown in the Drawings or as directed by the Engineer.

### **203.2 MATERIAL REQUIREMENTS**

#### **203.2.1 Mineral Aggregate**

Mineral aggregate for bituminous base course shall consist of coarse aggregate, fine aggregate and filler material, if required, all conforming to the following requirements:

Coarse aggregate which is the material retained on AASHTO No. 4 sieve shall consist of crushed rock, crushed gravel or crushed boulder. It shall be clean, hard, tough, sound, durable, and free from decomposed stones, organic matter, shale, clay lump or other deleterious substances. Rock or boulders, from which coarse aggregate is obtained, shall be of uniform quality throughout the quarry.

The crushing shall be so regulated that (material retained on sieve # 4) shall have all faces crushed without any uncrushed surface. The type of source shall be uniform throughout the quarry location from where such a material is obtained. Rock to be crushed for use as bituminous concrete aggregate, shall be screened in such a manner that all material to be crushed is retained on a 75 mm (3") screen.

Fine aggregate which is material passing No. 4 sieve, shall consist of 100% crushed material from rock and shall be stored separately. No natural sand will be allowed in the mix.

When the combined grading of the coarse and fine aggregates is deficient in material passing No. 200 sieve, additional filler material shall be added. The filler material shall consist of finely divided rock dust, including dust from plant collection system, hydrated lime, hydrated cement or other suitable mineral matters free of deleterious material conforming to the requirements of AASHTO M-17. However, in case the coarse aggregates are of quartzitic nature, then hydrated lime or a better material shall be required. At the time of use, it shall be sufficiently dry to flow freely. Filler material shall conform to following gradation:



**203.2.2 Asphalt Material**

Asphalt binder for asphalt base course shall be asphalt cement 60-70 penetration grade, conforming to the requirement in Table 301-2 of Item Asphaltic Materials in these Specifications.

When asphalt cement 60-70 penetration grade is used, the optimum ratio between bituminous material and filler shall be so determined that the bituminous filler mixture will reach its softening point, not less than eighty (80) degree centigrade when tested in accordance with AASHTO T 53

**203.2.3 Asphalt Base/Leveling Course Mixture**

The composition of the asphalt base/leveling course mixtures for base course shall conform to classes shown in the following table:

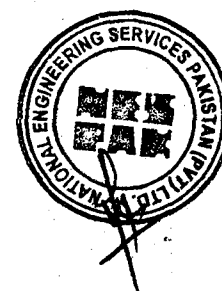
**Table 203-1**

**Combined Aggregate Grading Requirements**

Mix Designation	Class-A	Class-B
Use	Leveling/Base	Leveling/Base
Compacted Thickness	75-100 mm	75-100 mm
<i>U.S. Standard Sieve Size</i>	<i>Percent passing by weight</i>	
1½" (38 mm)	100	100
1" (25 mm)	75-90	90-100
¾" (19 mm)	65-80	-
½" (12.5 mm)	55-70	56-80
⅜" (9.5 mm)	45-60	-
No. 4 (4.75 mm)	30-45	29-59
No. 8 (2.38 mm)	15-35	19-45
No. 50 (0.300 mm)	5-15	5-17
No. 200 (0.075 mm)	2-7	1-7
Asphalt Content by weight of mix (%)	3 (Minimum)	

Class-B shall be used for Asphaltic Base / Levelling course unless specified otherwise by the Engineer. The grading limits specified are based on materials of uniform specific gravity and shall be adjusted by the Engineer to compensate any variation in specific gravity of individual sizes. The grading may be varied by the Engineer on the basis of Marshall Tests to obtained optimum stability and life of completed asphalt pavement. Grading limits determined by Fuller Equation (MS - 2) should be avoided.

The asphalt leveling/base course mixture shall meet the following Marshall Test Criteria:



Compaction, number of blows to each end of specimen

Stability (30 minutes/60 °C)	75 1,000 kg (Min.)
Flow, 0.25 mm (0.01 in.)	8-14 (2 – 3.5)
Percent air voids in mix	4-6
Percent voids in mineral aggregates	According to table 5.3 MS-2, Asphalt Institute sixth edition or the latest edition
Percent voids filled with asphalt	50-65
Loss of Marshall Stability	25 percent (max.)

#### 203.2.4 Job-Mix Formula

At least eight (8) weeks prior to commencement of asphalt, the Contractor shall start the tests for the design of JMF for the asphalt base course production for the Project. At least one week prior to production, a JMF for the asphalt mix to be used shall be established jointly by the Contractor and the Engineer meeting Project Specification requirements.

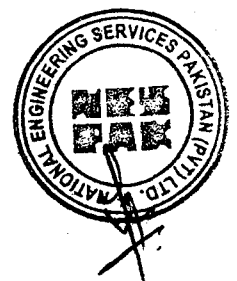
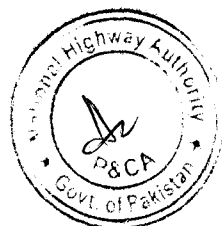
The JMF shall be established by Modified Marshall Method of Mix Design for Large Aggregate according to the procedure prescribed in the Asphalt Institute Manual Series No. 2 (MS-2), Sixth Edition, taking into account following recommendations.

The JMF, with the allowable tolerances shall be within the range specified in Item 203.2.3 and herein. Each JMF shall indicate a single percentage of aggregate passing each required sieve size and a single percentage of bitumen to be added to the aggregate.

Marshall mixing temperature shall be one hundred and sixty plus/minus five ( $160 \pm 5$ ) degree centigrade at which heated asphalt produces a kinematic viscosity one hundred and seventy  $\pm$  twenty ( $170 \pm 20$ ) centistokes.

Marshall compacting temperature shall be one hundred and forty five plus/minus five ( $145 \pm 5$ ) degree centigrade at which heated asphalt produces a kinematic viscosity of two hundred and eighty plus/minus thirty ( $280 \pm 30$ ) centistokes.

The combined gradation should produce a smooth curve within the master grading band for designated mix. The job-mix formula with allowable tolerances for a single test then becomes the job control grading band. If application of job-mix



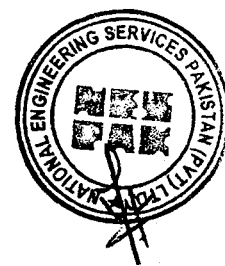
tolerances results in a job control grading band outside the master grading band, the full tolerances shall still apply. The asphalt content thus determined shall be used to check for compliance for stability, flow and voids filled, etc. as per the specifications. Minimum coating of bitumen film on aggregate should be 8 micron.

### METHODOLOGY FOR MODIFIED MARSHAL METHOD

Mixes composed of larger size aggregates with maximum size up to 38 mm (1.5 inches) will be prepared according to modified Marshall Method as per MS-2 Asphalt institute, sixth edition, 1993 or the latest edition. The procedure is basically the same as the original method except for following differences that are due to the larger specimen size that is used:

- a) The hammer weighs 10.2 kg (22.5 lb.) and has a 149.4 mm (5.88 inches) flat tamping face. Only mechanically-operated device is used for the same 457 mm (18 inches) drop height.
- b) The specimen has a 152.4 mm (6 inches) diameter by, 95.2 mm (3.75 inches) height.
- c) The batch weights are typically of 4 Kg.
- d) The equipment for compacting and testing (molds and breaking heads) are proportionately larger to accommodate the larger specimens.
- e) The mix is placed in the mold in two approximately equal increments, with spading performed after each increment to avoid honey-combing.
- f) The number of blows needed for the larger specimen is 1.5 times (75 or 112 blows) of that required for the smaller specimen (50 or 75 blows) to obtain equivalent compaction.
- g) The design criteria shall be modified as well, the minimum stability shall be 2.25 times and the range of flow values shall be 1.5 times normal-sized specimens.
- h) Similar to the normal procedure, following values shall be used to convert the measured stability values to an equivalent value for a specimen with a 95.2 mm (3.75 inches) thickness, if the actual thickness varies:

Approximate Height mm (inches)	Specimen Volume (Cubic cm)	Correlation Ratio
88.9 (3 1/2)	1608 to 1626	1.12
90.5 (3 9/16)	1637 to 1665	1.09
92.1 (3 5/8)	1666 to 1694	1.06
93.7 (3 11/16)	1695 to 1723	1.03
95.2 (3 3/4)	1724 to 1752	1.00
96.8 (3 13/16)	1753 to 1781	0.97
98.4 (3 7/8)	1782 to 1810	0.95
100.0 (3 15/16)	1811 to 1839	0.92
101.6 (4)	1840 to 1968.	0.90



Prior to final approval, the proposed job mix, with a Asphalt content at the permissible upper percentage limit determined in JMF, shall be compacted to refusal density (when density does not increase with additional compaction efforts or breakage of stones start) such that the resulting air voids in the mix shall not be less than 3%.

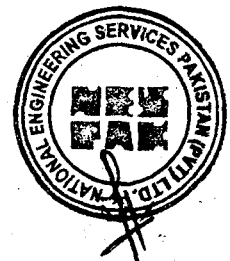
Once JMF is established, all mixtures furnished for the project represented by samples taken from the asphalt plant during operation, shall conform thereto. Moreover upon receiving the job-mix, approved by the Engineer, the Contractor shall adjust his plant to proportion the individual aggregates, mineral filler and asphalt to produce a final mix that when compared to job mix formula shall be within the following limits.

**Maximum Variation of Percentage of Materials**

Retained No. 4 and larger	± 7.0 %
Passing No. 4 to No. 100 sieve	± 4.0 %
Passing No. 200	± 1.0 %
Asphalt Content (weight % of total mixture)	-0.2% to +0.2 %

In addition to meeting the requirements specified in the preceding items, the mixture as established by the JMF shall also satisfy the following physical properties:

- a) Loss of Marshall Stability by immersion of specimen in water at sixty (60) degree centigrade for 24 hours as compared with stability measured after immersion in water at sixty (60) degrees centigrade for twenty (20) minutes shall not exceeds twenty five (25) percent. If the mixture fails to meet this criterion, the JMF shall be modified.
- b) In case mix fails to meet the stripping test requirement then anti-stripping agent shall be used for which no separate payment shall be made.
- c) Should a change of source of materials be made, a new JMF shall be established before the new material is used. When unsatisfactory results or other conditions make it necessary, a new Job Mix Formula will be required.
- d) The assistance of the Engineer in the preparation of the job standard mix in no way relieves the Contractor of the responsibility of producing an Asphalt mix meeting the requirements of the Specifications.
- e) The density of the compacted mixes shall be related to the daily Marshall Density which shall be determined by making three standard Marshall Specimens from samples of the mix taken from behind the paver. The density of each sample shall be determined and compared with the mean value. Any individual result which varies from the mean by more than 0.015 gm/cc shall be rejected. Marshall Test shall be repeated on a daily basis to establish the



- f) Daily Marshall Density for that particular day's work or one sample of 500T production. The daily Marshall Density shall not vary from the Job Mix Design Density by more than  $\pm 1.0\%$ . Loss of stability shall be tested on other three Marshall Specimens from samples of the mix taken from behind the paver.
- g) The compliance criteria contained in the Job Mix Tolerances provide an indication of the maximum acceptable value of the standard deviation for each parameter. If asphalt mix shows variation in excess of these limits, the source of variation shall be determined by the Contractor and rectified by him to the satisfaction of Project Specifications and Engineer. If the excessive variations continue, the Engineer shall order stoppage of production and laying for the Works, until the Contractor has demonstrated his ability to re-establish acceptable control.

### **203.2.5 Asphalt Additives**

Hydrated lime or any other additive may be used as an anti-stripping agent as and when required. When used, hydrated lime shall be added at a rate between 1% and 2% by weight of the total mix with the aim of eliminating stripping tendencies. Hydrated lime shall be fed by a separated feeding system into pug mill for each batch. Percentage of additive and relative specifications for any other type of additives shall be based on manufacturer's specifications for the product, subject to approval of the Engineer.

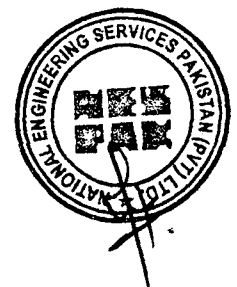
No additional cost shall be paid for use of hydrated lime or any other anti-stripping additive, and payment shall be deemed to be included in the respective pay items of asphaltic base course.

## **203.3 CONSTRUCTION REQUIREMENTS**

### **203.3.1 Asphalt Mixing Plant**

Mixing plants used for the preparation of Asphalt Mixtures shall be batch plants conforming to AASHTO M-156, and of adequate capacity, coordinated and operated to produce a mixture within the limits of specifications. Plant shall have minimum three cold bins and at least 3<sup>1/2</sup> decks of hot sieves to effectively control the gradation of hot bins. It should be provided with facilities necessary for protection of environment such as dust control facility. Special emphasis shall be given to the following considerations:

- A large bucket to handle a batch in a single weighing.
- The mixer box shall be equipped with a dust hood to prevent loss of dust by dispersion.
- A mechanical batch counter shall be installed as part of the timing device and shall be designated to register only completely mixed batches.



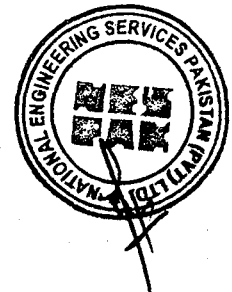


US Standard Sieve	Percent Passing by Weight
No. 30	100
No. 50	95 - 100
No. 200	70 - 100

The ratio of filler to binder should range from 1.0-1.5.

The coarse and fine aggregates shall meet the following requirements:

- a) The coarse aggregate shall have a percentage of wear by the Los Angeles Abrasion test (AASHTO-T-96) not more than forty (40).
- b) The coarse and fine aggregates shall have a Specific Gravity value of not less than 2.60 and value for absorption of water not more than 2% as determined by AASHTO T 84 and T 85.
- c) The material shall have a loss of less than twelve (12) percent when subjected to five cycles of the Sodium Sulphate Soundness test according to (AASHTO T-104).
- d) The Sand Equivalent (AASHTO T 176) determined after all processing except for addition of asphalt cement shall not be less than forty five (45).
- e) The fine fraction of the material shall have a liquid limit not more than twenty five (25) and a Plasticity Index (as determined by AASHTO T-89 and T-90) not more than four (4). The plasticity index of mineral filler should not be more than four (4).
- f) The portion of aggregate retained on the 9.5 mm (3/8 inch) sieve shall not contain more than fifteen (15) percent by weight of flat and/or elongated particles as determined in accordance with ASTM D 4791, standard test method for flat and/or elongated pieces (ratio of maximum to minimum dimension = 3:1).
- g) The coarse aggregate when tested by the Coating and Stripping Test (AASHTO T-182) shall have a coated area above ninety five (95) percent.
- h) Petrographic examination of the coarse aggregate is mandatory for the approval of source. The coarse aggregates shall be checked for cationic and anionic behavior so that their affinity with the bitumen to be used is verified.



- The plant shall be fully computerized batch-plant.
- The automatic proportioning system shall be capable of consistently delivering materials within the full range of batch sizes within the following tolerances:

Description	Total Batch Weight of Paving Mix %
Batch aggregate component	±1.5
Mineral filler	±0.5
Bituminous material	±0.1
Zero return (aggregate)	±0.5
Zero return (bituminous material)	±0.1

An automatic graphic or digital record shall be produced for each batch of bituminous concrete indicating the proportions of each aggregate component, mineral filler, and bituminous material. Such records of the batches shall be further identified through a print of day and date. Bituminous material proportions shall be recorded either as weight or volume.

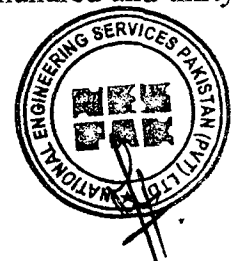
### 203.3.2 Preparation of Aggregates

Before being fed to the dryer, aggregates for the asphalt base courses shall be separated into three or more sizes and stored separately in cold bins. One bin shall contain aggregate of such size that eighty (80) percent will pass sieve No. 4, and the other two bins shall contain aggregate of such sizes that eighty (80) percent will be retained on sieve No. 4. Should fine material, be incorporated in the mix, a separate bin shall be provided in addition to the three bins mentioned above. If filler is used as a separate component it will also be stored and measured separately and accurately before being fed into the mixer through filler screw mechanism.

Each aggregate ingredient shall be heated and dried at a temperature not to exceed one hundred and seventy (170) degree centigrade. If aggregates contain sufficient moisture to cause foaming in the mixture or their temperature is in excess of one hundred and seventy (170) degree centigrade they shall be removed from the bins and returned to their respective stock piles. Immediately after heating, the aggregates shall be screened to required sizes and stored in separate bins for batching and mixing with Asphalt material

In placing the materials in bins or in moving those from bins to the mixer, any method which causes segregation or uncontrolled combination of material of different grading shall be discontinued.

Asphalt cement shall be heated within a temperature range of hundred and thirty



five to hundred and sixty three (135-163) degrees centigrade at the time of mixing. Asphalt cement heated above maximum shown shall be considered overheated and shall be rejected and removed from job site.

Dried aggregate weighed and drawn to pug-mill shall be combined with proportionate quantity of asphalt cement according to the job mix formula. Temperature of asphalt, except for temporary fluctuations, shall not be lower than fifteen (15) degree centigrade below the temperature of the aggregate, at the time; the two materials enter into the pug-mill. In no case shall the temperature of an asphalt mix exceed one hundred and sixty five (165) degree centigrade when discharged from the pug-mill.

### 203.3.3 Hauling Equipment

Dump truck used for hauling bituminous mixtures shall have tight, clean, smooth metal beds which have been thinly coated with an approved material to prevent adhering of material to the beds. Each truck shall have a cover of canvas or of other suitable material of sufficient size as to protect the mixture from the weather. The mixture will be delivered on the road at a temperature not less than hundred and forty five plus/minus five ( $145 \pm 5$ ) degree C. Drivers of dump trucks will ensure that while reversing the vehicles, paver is not pushed back producing a hump.

### 203.3.4 Bituminous Pavers

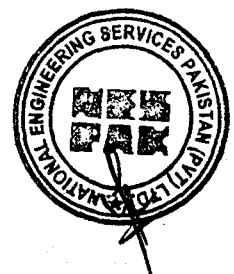
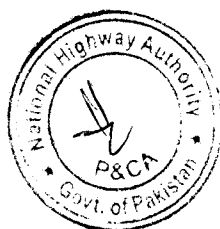
Bituminous pavers shall be self-contained, power-propelled units, provided with an automatically controlled activated screed or strike-off assembly, heated if necessary, capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and thickness shown on the plans. Pavers used for shoulders and similar construction shall be capable of spreading and finishing course of bituminous plant mix material in widths shown on the plans.

The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The paver shall be equipped with automatic feed controls, properly adjusted to maintain a uniform depth of material ahead of the screed.

The screed or strike-off assembly shall be capable of producing a finished surface of the required evenness and texture without tearing, shoving or gouging the mixture.

When laying the mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture. The paver shall be operated at speeds which will give the best result for the type of power being used.

The mixed material shall be delivered to paver in time to permit completion of spreading, finishing and compaction of mixture during day light hours.



The paver shall be equipped with automatic screed controls with sensors for either or both sides of the paver, capable of sensing grade from an outside reference line, sensing the transverse slope of the screed and providing the automatic signals which operate the screed to maintain the desired grade and transverse slope. The sensor shall be so constructed that it will operate from a reference line or a ski-like arrangement.

The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent variation.

Manual operation will only be permitted in the construction of irregularly shaped and minor areas.

Whenever a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods in order to allow the contractor to use the asphalt already produced at the plant or in transit, provided this method of operation will produce results otherwise meeting the specifications.

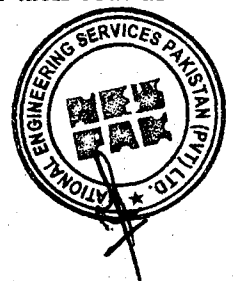
Reference lines will be required for both outer edges of the traveled way for each main line roadway for vertical control. Horizontal control utilizing the reference line will be permitted. The grade and slope for intermediate lanes shall be controlled automatically from reference lines or by means of a ski and a slope control device or a dual ski arrangement. When the finish of the grade prepared for paving is superior to the established tolerance and, when in the opinion of the Engineer, further improvement to the line, grade, cross sections and smoothness can best be achieved without the use of the reference line; a ski-like arrangement may be substituted subject to the approval of the Engineer. The use of the reference lines shall be reinstated immediately whenever the Contractor fails to maintain a superior pavement. The Contractor shall furnish and install all pins, brackets, tensioning devices, wire and accessories necessary for satisfactory operation of the automatic control equipment.

### **203.3.5 Rollers**

Rollers shall be steel wheel, pneumatic tyre and vibratory, or a combination thereof. The roller(s) shall be in good condition, capable of reversing without backlash, and shall be operated at speeds slow enough to avoid displacement of the bituminous mixture. The number and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. Vibratory rollers shall be acceptable for bituminous mixture compaction. The use of equipment, which results in excessive crushing of the aggregate, will not be permitted.

### **203.3.6 Preparation of Base or Existing Pavement Surface**

Before spreading materials, the surface of base or existing pavement on which the mix is to be placed shall be conditioned by application of a prime or tack coat as specified.



After a prime coat is applied, it shall be left undisturbed not less than forty eight (48) hours. The Contractor shall maintain the primed surface until the mix material has been placed. This maintenance shall include the spreading of sand or other approved material, if necessary to prevent adherence of the prime coat to the tyres of vehicles using the primed surface, and patching any breaks in the primed surface with additional bituminous material. Any area of primed surface that has become damaged shall be repaired before the mix is placed, to the satisfaction of Engineer. It shall be ensured that primed surface is not in tacky condition, when premix is laid.

After a tack coat is applied, it shall be allowed to dry until it is in the proper condition of tackiness to receive the mix. The tack coat shall be applied only as far in advance of the placing of mix, as is necessary to obtain the proper condition of tackiness. Any breaks in the tack coat shall be repaired.

When the surface of the existing pavement or old base is irregular, it shall be brought to uniform grade and cross-section by leveling course as directed. The leveling course mixture shall conform to the requirements of Item 203.2.

A thin coating of bituminous material shall be sprayed on contact surface of curbing, gutters, manholes, and other structures, prior to the bituminous mixture being placed against them.

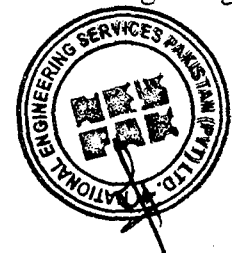
#### 203.3.7 Spreading and Finishing

The mixture shall be laid upon an approved surface, spread and struck off to the section and elevation established. Bituminous pavers shall be used to distribute the mixture either over the entire width or over such partial width as may be practicable.

Longitudinal joints for each course shall be offset thirty (30) centimeters from the joint in the immediate underlying course. Transverse joints shall be offset a minimum of sixty (60) centimeters from the joint of the immediate underlying course.

Longitudinal joints shall be located within fifteen (15) centimeters of the centerline of the roadway or within fifteen (15) centimeters of the centerline of a lane. Longitudinal joints shall be held to the minimum practical number. Longitudinal joints shall be formed by lapping the screed over the first layer placed, crowding a ridge of Asphalt material at the joint and crimping the ridge of material into the joint by a compaction roller while the material is hot.

Transverse joints shall be formed by cutting back the first layer placed to the full depth of the layer, removing and wasting the material, spreading new Asphalt material in sufficient quantity to create a compacted thickness equal to the thickness of the first layer. The joint shall be cross rolled with one coverage and the joint checked with a straight edge not less than four (4) meters in length. High points shall be removed and sags filled with additional Asphalt material and the joint rolled a second time. The joint shall again be checked with a straight edge,



humps and sags adjusted as necessary, and rolled until the joint is complete and compacted as specified.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture shall be spread, raked and luted by hand-tools. For such areas the mixture shall be dumped, spread and screeded to give the required compacted thickness, ensuring even distribution of coarse and fine material.

When production of the mixture can be maintained and wherever practical, pavers shall be used in echelon to place the wearing course in adjacent lanes and compacted to form a surface without lateral joint.

All mixtures shall be spread at a temperature of not less than hundred and forty five plus/minus five ( $145 \pm 5$ ) degree C and all initial rolling or tamping shall be performed when the temperature of the mixture is such that the sum of the air temperature plus the temperature of the mixture is between 165 degree C and 190 degree C. The mixture shall not be placed on any wet surface or when weather conditions will otherwise prevent its proper handling or finishing.

Asphalt concrete pavement asphalt base course shall not be placed on any wet or frozen surface, during rain, dust or sand storms, when wind or other weather conditions prevent the proper handling of the Asphalt mixtures or when atmospheric temperature is five (5) degree centigrade or less. Care should be taken during spreading operation under windy condition in winter, even if temperature is above five (5) degree centigrade.

The spreading operations should be immediately terminated if it begins to rain during the operation.

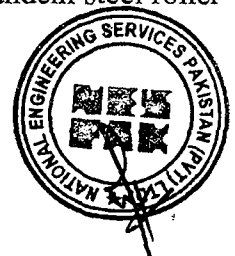
Hand laying of any Asphalt material will be permitted only in the following circumstances:

- a) For laying regulating courses of irregular shape and varying thickness;
- b) In confined spaces where it is impracticable for a paver to operate;
- c) For footways;
- d) At the approaches to expansion joints at bridges or viaducts;

### 203.3.8 Compaction

After spreading and strike off and as soon as the mix condition permits the rolling to be performed without excessive shoving or tearing, the mixture shall be thoroughly and uniformly compacted. Rolling shall not be prolonged when cracks appear on the surface.

Initial or breakdown rolling shall be done by means of either a tandem steel roller



or three wheeled steel roller. Rolling shall begin as soon as the mixture will bear the roller without undue displacement.

The number and weight of rollers shall be sufficient to obtain the required compaction while the mixture is still in workable condition. The sequence of rolling and the selection of roller types shall provide the specified pavement density. Initial rolling with a tandem steel roller or a three-wheeled steel roller shall follow the paver as closely as possible.

Unless otherwise directed, rolling shall begin at the lower side and proceed longitudinally, parallel to the road centerline, each trip overlapping one-half of the roller width, gradually progressing to the crown of the road. When paving in echelon or abutting a previously placed lane, the longitudinal joint should be rolled first followed by the regular rolling procedure. On super elevated curves the rolling shall begin at the low side and progress to the high side by overlapping of longitudinal trips parallel to the centerline. Intermediate rolling with a pneumatic tyred roller shall be done behind the initial rolling. Final rolling shall eliminate marks from previous rolling. In no case shall the temperature be less than hundred and twenty (120) degree C. for initial break down rolling while all other compaction operations shall be completed before the temperature drops down to hundred and ten (110) degree C.

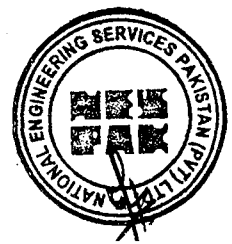
Rollers shall move at a slow but uniform speed with the drive roll or wheels nearest the paver. Rolling shall be continued until all roller marks are eliminated and a minimum density of Ninety seven (97) percent of a laboratory compacted specimen made from asphalt material obtained for daily Marshall Density is achieved.

Relevant test methods for density of bituminous concrete in place by Nuclear Methods such as ASTM D 2950 (latest version) and or other method as directed by the Engineer shall be used to establish the proper rolling effort and pattern to achieve the required density and to ensure achieving the specified percent compaction during the placement of the bituminous concrete as quality control testing. A calibration factor for the Nuclear Method must be established as per the equipment's manufacture's requirements, and at any time a change is made in the paving mixture, in construction process or after every fifteen days of asphalt production whichever is earlier. Compare the results obtained to samples compacted to Marshall Density to determine percentage of compaction.

Any displacement resulting while reversing the direction of a roller, or from other causes, shall be corrected at once by the use of rakes and addition of fresh mixture when required. Care shall be exercised in rolling not to displace the line and grade of the edges of the bituminous mixture.

To prevent adhesion of the mixture to the rollers, wheels of rollers shall be kept properly moistened with water or water mixed with very small quantities of detergent or other approved material. Excess liquid will not be permitted.

Along forms, curbs, headers, walls and other places not accessible to the roller,



the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons or with mechanical tampers. On depressed areas, tampers be used or cleated compression strips may be used under the roller to transmit compression to the depressed area.

Any mixture that becomes loose and broken, mixed with dirt, or is in any way defective in finish or density shall be removed and replaced with fresh hot mixture, which shall be compacted to conform to the surrounding area. Any area showing an excess or deficiency of bituminous material shall be removed and replaced.

Three steps of rolling are as follows:

**a) Breakdown Rolling**

Breakdown Rolling may be accomplished with static or vibratory steel-wheeled rollers. Compaction shall be carried out using rollers of approved dead weight smooth wheeled rollers or by multi-wheeled pneumatic tyred rollers of equivalent mass, or by vibratory rollers or a combination of these. Asphalt base/leveling course material shall always be surface finished with a smooth wheeled roller which may be a dead weight roller or alternatively a vibratory roller in non-vibrating mode. Vibratory rollers shall not be used in vibrating mode on bridge decks.

Vibratory rollers may only be used if they are capable of achieving at least the standard of compaction of 9-tonne dead weight roller to meet the specified percent compaction of Marshall Max. Density, and shall be equipped or provided with devices indicating the frequency at which the mechanism is operating and the speed of travel which can be read from the ground.

It is important to start the rolling operation on the low side of the mat (usually the outside of the lane being paved) and progress towards the high side. When adjoining lanes are placed, the same rolling procedure should be followed but only after compaction of the longitudinal joint.

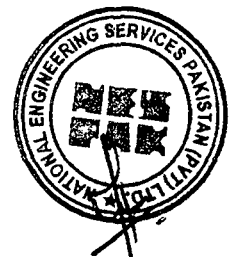
**b) Intermediate Rolling**

Intermediate rolling with pneumatic tyre rollers and should follow breakdown rolling as closely as possible, while the asphalt mix is still well above the minimum temperature at which densification can be achieved.

Intermediate rolling should be continuous until all of the mix placed has been thoroughly compacted. Regardless of the type of rollers used, the rolling pattern should be developed in the same manner as for breakdown rolling.

**c) Finish Rolling**

Finish rolling is done solely for the improvement of the surface. It should be accomplished with steel-tired, static-weight tandems or vibratory tandems without vibration while the material is still warm enough for removal of roller





marks.

The material shall be rolled in a longitudinal direction with the driven rolls nearest the paver. The roller should first compact the material adjacent to any joints and then work from the lower to the upper side of the layer overlapping on successive passes by at least half the width of the rear roll or in the case of a pneumatic tyre roller, at least the nominal width of one tyre.

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

### 203.3.9 Frequency of Testing for Cores

One core shall be taken for each 100 linear meter of each lane of Asphalt Base, or fraction thereof, in special cases. If the core so taken fails to achieve the specified compaction (97%), then two (2) additional cores shall be taken in the longitudinal alignment of the road at an interval of three (3) meters on either side with respect to the failing core. If all the three cores give an average of 97% compaction, and the individual compaction of any core is not less than ninety five (95) percent, then the compaction shall be acceptable. If average of the three cores further fails against compaction, then two (2) additional cores shall be taken at a distance of fifteen (15) meters on either side and compaction shall be checked for all the five cores in the same fashion. If average of five cores is 97%, the area will be accepted. In case average of 5 (five) cores is ninety six percent (96%) or more, then Engineer may withhold the payment partly and observe behavior during maintenance period, for the release of full payment or otherwise. In case of failure of the average of these five cores giving average compaction of less than 96%, the failed area shall be removed and subsequently be replaced by specified mix in an approved manner at the expense of Contractor.

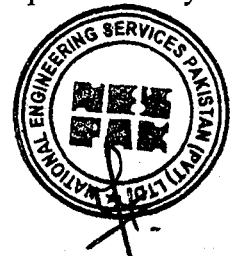
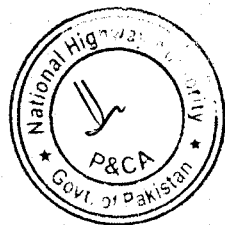
### 203.3.10 Surface Tolerances

Surface smoothness of asphalt base/leveling course shall be measured with four (4) M straightedge by Engineer at selected locations. The variation of surface from testing edge of straightedge between any two (2) contacts shall be determined by placing it parallel and perpendicular to center line of roadway and value thus determined should not vary more than limits prescribed by "Table for Allowable Tolerances" in these Specifications.

Any irregularities that exceed the specified tolerances or that retain water on the surface shall be corrected by removing the defective area and replacing with new asphalt base course without additional cost to the Employer.

### 203.3.11 Base Thickness Tolerances

For determination of thickness, one (1) core for each hundred (100) linear meter of each lane shall be taken. Unless otherwise permitted, cores extracted for thickness measurement shall not be used for density determination and density cores shall not be used for thickness measurements unless permitted by the



Engineer.

When layer thickness of asphaltic base course is deficient by more than five (5) mm from that specified in the Drawings, the deficiency shall be removed with satisfactory base course material and/or made up by additional asphalt concrete wearing course thickness without extra cost to the Employer. If such remedial action is authorized, revised thickness determinations shall be made by measurements of new cores taken after placing of "Asphaltic Wearing Course" material or as directed by the Engineer. If base course deficiencies are corrected in this manner, full payment for the "Asphaltic Base Course" will be made to the Contractor, but no additional payment will be made for the increase in thickness of the "Asphaltic Wearing Course".

### **203.3.12 Acceptance Sampling and Testing**

Acceptance of samples and testing of materials and construction requirements, shall be governed by the relevant, "Table for Sampling and Testing Frequency" or as approved by the Engineer.

### **203.3.13 Trial Section**

At least 3 days before material from each source of the asphalt concrete is first laid in the Works, the Contractor shall lay a trial area to demonstrate the compaction plant and rolling procedure selected by him for achieving the specified density.

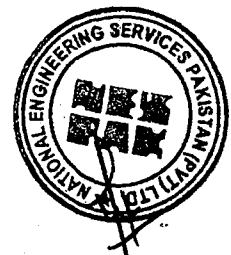
- a) The trial area shall be not less than 200 m in length and of a width to be approved by the Engineer. If the trial area complies with the Specifications, it may form part of the permanent Works;
- b) For the trial the Contractor shall use the materials, mixing and laying plant proposed for the main works;
- c) Where the required level of compaction is not achieved the trial area shall be removed and the trial repeated.

The Engineer shall approve test results and general performance of test area before actual commencement of the work.

## **203.4 MEASUREMENT AND PAYMENT**

### **203.4.1 Measurement**

The quantities for asphaltic leveling / base course will be measured by volume in cubic meters compacted in place. Measurement shall be based on the dimension as shown on plan or as otherwise directed or authorized by the Engineer. No measurement shall be made for unauthorized areas or for extra thickness.



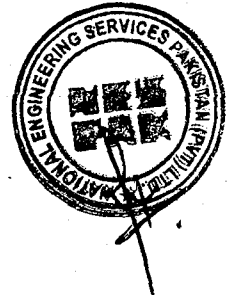
The quantity of asphaltic material used is included in the asphalt mixture and will not be measured separately.

Quantities of liquid asphalt, wasted or remaining on hand after completion of the work, shall not be measured or paid for.

#### 203.4.2 Payment

The quantity determined as provided above shall be paid by volume in cubic meter compacted in place for at the contract unit price for the particular pay item listed below and shown in the Bill of Quantities, which payment shall constitute full compensation for furnishing all labour, materials, tools, plant, equipment, mixing, transporting, laying, shaping, compacting, corrections, maintenance and all the incidentals necessary for the proper completion of the work prescribed in this item. Asphalt additives or anti-stripping agent if allowed and used to meet with JMF requirement shall not be paid directly, payment shall be to be included in the respective pay items of Asphalt Base Course (Hot Plant Mix).

Pay Item No.	Description	Unit of Measurement
203a	Asphaltic Base / Levelling Course - Plant Mix, Class A	CM
203b	Asphaltic Base / Levelling Course - Plant Mix, Class B	CM



**ITEM 305 ASPHALT WEARING COURSE – HOT PLANT MIX**

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Delete this Item and replace with the following:

**305.1 DESCRIPTION**

This work shall consist of furnishing and mixing aggregates, asphalt binder and additive material (where required) at a central asphalt mixing plant, to a specified temperature, hauling, including loading unloading, laying and compacting the mixture on an approved primed or tacked base, bridge deck or concrete pavement in accordance with these Specifications and in conformity with the lines grades and typical cross-sections shown in the Drawings or as directed by the Engineer.

**305.2 MATERIAL REQUIREMENTS**

**305.2.1 Asphalt Material**

Asphalt Binder for Wearing Course shall be 60/70 penetration grade conforming to requirement in Table 301-2 section Asphaltic Materials in these Specifications.

When penetration grade asphalt 60/70 is used, the optimum ratio between bituminous material and filler shall be so determined that the bituminous filler mixture will reach its softening point, not less than eighty (80) degree centigrade when tested in accordance with AASHTO T 53.

**305.2.2 Mineral Aggregates**

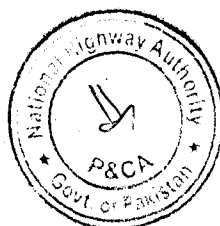
Mineral aggregates shall consist of coarse aggregate, fine aggregate and crushed rock filler material.

The coarse and fine aggregates shall be clean, hard, durable and sound particles of uniform quality, free from decomposed material, organic material, clay lumps or other deleterious substances.

The coarse aggregate which is the material retained on sieve No. 4 (4.75mm) shall consist of crushed rock 100 % particles having all faces fractured mechanically. The working face of the quarries from which mineral aggregates are being extracted shall be acceptably uniform and be free from layers, veins or intrusions of weathered rock, soil or other unsuitable minerals.

Rock to be crushed for use as bituminous concrete aggregate, shall be screened in such a manner that all material to be crushed is retained on a 75 mm (3") screen.

Fine aggregate which is material passing an AASHTO No. 4 sieve (Khaka / Stone dust), shall consist of 100% crushed limestone from rock having all faces fractured. Fine aggregate shall be stored separately. Natural sand shall not be used in the mix.



When the combined grading of the coarse and fine aggregates is deficient in material passing the AASHTO No. 200 sieve, supplemental fine aggregate shall be mineral filler consist of finely divided rock dust including dust from the plant dust collection system or cement free of deleterious material conforming to the following grading:

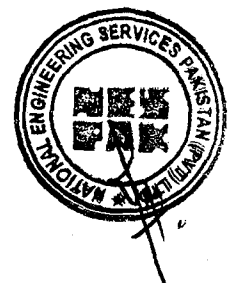
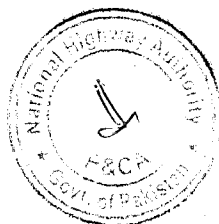
Standard Sieve Size AASHTO	Percentage Passing by Weight
No. 30	100
No. 50	95-100
No. 200	70-100

Mineral filler, at the time of use, shall be dry, free flowing, without lumps or agglomerations and conform to the requirements of AASHTO M-17.

The ratio of filler to binder should range from 1.0-1.5

The coarse and fine aggregates shall meet the following requirements:

- a) The coarse aggregate shall have a percentage loss by the Los Angeles Abrasion test (AASHTO T-96) of not more than thirty (30) percent.
- b) The coarse aggregates and fine aggregate shall have a Specific Gravity Value of not less than 2.65 & 2.60 respectively and value for absorption of water not more than 2% as determined by AASHTO T 84 and T 85.
- c) The material shall have a loss of less than ten (10) percent when subjected to five cycles of the Sodium Sulphate Soundness test according to AASHTO T-104.
- d) The Sand Equivalent (AASHTO T-176) determined after all processing except for addition of asphalt cement shall not be less than forty five (45).
- e) The fine fraction of the material shall have a liquid limit not more than twenty five (25) and a plasticity index (as determined by AASHTO T-89 and T-90) not greater than four (4). The plasticity index of mineral filler (if added separately) should not be more than four (4).
- f) The portion of aggregate retained on the 9.5 mm (3/8 inch) sieve shall not contain more than ten percent (10 %) flat and/or elongated particles (ratio of maximum to minimum dimensions = 3:1) or as determined in accordance with ASTM D 4791, standard test method for flat and/or elongated pieces.
- g) The coarse aggregate when tested by the Coating and Stripping Test (AASHTO T-182) shall have a coated area above 95 percent. In addition to this test, a test for coating and stripping shall be run after submerging the coated material in water at 60° C for 96 hours. The aggregate in this test shall have a coated area of above 80 percent.



- g) Petrographic examination of the coarse aggregate is mandatory for the approval of source. The coarse aggregates shall be checked for cationic and anionic behavior so that their affinity with the bitumen is verified.

### 305.2.3 Asphalt Concrete Wearing Course Mixture

The grading of combined aggregates prior to addition of bituminous material shall conform to gradation requirements within the following range:

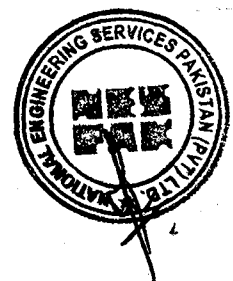
Combined Aggregate Grading Requirements as per ASTM D 3515

Standard AASHTO Sieve Sizes	Percentage Passing by Weight	
	Class A	Class B
1" (25.0 mm)	100	-
3/4" (19.0 mm)	90 - 100	100
1/2" (12.5 mm)	-	90 - 100
3/8" (9.5 mm)	56 - 80	-
No. 4 (4.75 mm)	35 - 65	44 - 74
No. 8 (2.36 mm)	23 - 49	28 - 56
No. 50 (0.3 mm)	5 - 19	5 - 21
No. 200 (0.075 mm)	2 - 8	2 - 10

The minimum binder content shall be 3.5 percent by mass of total weight of mix. The grading limits specified are based on materials of uniform specific gravity and shall be adjusted by the Engineer to compensate any variation in specific gravity of individual sizes. The grading may be varied by the Engineer on the basis of Marshall Tests to obtained optimum stability and life of completed Asphalt Concrete Pavement. Limits determined by Fuller Equation (MS - 2) should be avoided. Class A shall be adopted unless specifically advised otherwise by the Engineer.

The asphalt concrete wearing course mixture shall meet the following Marshall Test Criteria:

Compaction (number of blows each end of specimen)	75
Stability (minimum) 30 minutes/60°C	1200 kg
Flow, 0.25 mm (0.01 inch)	8 - 14 (2 - 3.5)
Percent of air voids in mix	3.5 - 5.5
Minimum voids in mineral aggregate	According to Table 5.3 MS-2, Asphalt Institute, sixth edition 1993
Percent Voids filled with Asphalt	60 - 75
Loss of stability (maximum)	20



#### 305.2.4 Asphalt Concrete Job-Mix Formula (JMF)

At least eight (8) weeks prior to commencement of asphalt production, the Contractor shall start the tests for the design of a proposed JMF as described in Subsection 305.2.3 above. At least one (1) week prior to production, a JMF for the asphalt mix to be used shall be established jointly by the Contractor and the Engineer.

The JMF shall be established by Marshall Method of Mix Design according to the procedure prescribed in the Asphalt Institute Manual Series No. 2 (MS-2), Oct; 1993 Edition or the latest edition with the following recommendations taken into account:

The JMF, with the allowable tolerances shall be within the range specified in Item 305.2.3 and herein. Each JMF shall indicate a single percentage of aggregate passing each required sieve size and a single percentage of bitumen to be added to the aggregate.

- Marshall mixing temperature shall be one hundred and sixty plus/minus five ( $160 \pm 5$ ) degree centigrade at which heated asphalt produces a kinematic viscosity one hundred and seventy plus/minus twenty ( $170 \pm 20$ ) centi stoke.
- Marshall compacting temperature shall be one hundred and forty five plus/minus five ( $145 \pm 5$ ) ° C at which heated asphalt produces a kinematic viscosity of two hundred and eighty plus/minus thirty ( $280 \pm 30$ ) centi stoke.
- The combined gradation should produce a smooth curve within the master grading band for designated mix. The job-mix formula with allowable tolerances for a single test then becomes the job control grading band. If application of job-mix tolerances results in a job control grading band outside the master grading band, the full tolerances shall still apply. The asphalt content thus determined shall be used to check for compliance for stability, flow and voids filled, etc. as per the specifications. Minimum coating of bitumen film on aggregate should be 8 micron.
- The minimum bitumen binder content according to the results of the Marshall Method of Mix Design should be used provided that it will still satisfy the durability, the stability and the void content requirements.
- The optimum asphalt content shall be based on the percent asphalt content having at least 4.0% air voids for wearing course. The asphalt content thus determined shall be used to check for compliance for stability, flow and voids filled, etc. as per the specifications. Minimum coating of bitumen film on aggregate should be 8 micron.
- Prior to final approval, the proposed job mix, with a bituminous content at the permissible upper percentage limit, shall be compacted to refusal, (400 to 600 blows) and the resulting voids in the mix shall not be less than 2%.



Once JMF is established, all mixtures furnished for the project represented by samples taken from the asphalt plant during operation, shall conform thereto. Moreover upon receiving the job-mix, approved by the Engineer, the Contractor shall adjust his plant to proportion the individual aggregates, mineral filler and asphalt to produce a final mix that when compared to job mix formula shall be within the following limits.

**Tolerances for Job-Mix Formula:**

<b>Sieve Size</b>	<b>Tolerance %</b>
19 mm (3/4") and larger	± 5
9.5 mm (3/8") and 4.75 mm (No. 4)	± 5
2.36 mm (No. 8)	± 4
300 µm (No. 50)	± 3
75 µm (No. 200)	± 1
Asphalt Content (weight % of total mixture)	-0.2 % to +0.2 %

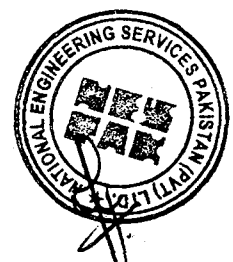
In addition to meeting the requirements specified in the preceding items, the mixture as established by the JMF shall also satisfy the following physical property.

Loss of Marshall Stability by immersion of specimens in water at sixty (60)<sup>0</sup>C for twenty four (24) hours as compared with the stability measured after immersion in water at sixty (60)<sup>0</sup>C for twenty (20) minutes shall not exceed twenty (20) percent. If the mixture fails to meet this criterion, the JMF shall be modified or an approved anti-stripping agent shall be used. No payment shall be made for anti stripping agent.

Test results along with samples shall be presented to the Engineer for verification and final approval of JMF.

Should a change of source of materials be made, a new JMF shall be established before the new material is used. Also, if results or other conditions make it necessary a new JMF will be required.

The density of the compacted mixes shall be related to the daily Marshall Density which shall be determined by making six standard Marshall Specimens from samples of the mix taken from behind the paver. The density of each sample shall be determined and compared with the mean value. Any individual result which varies from the mean by more than 0.015 gm/cc shall be rejected. Marshall Test shall be repeated on daily basis to establish daily Marshall Density for that particular day's work or one sample for 500 T productions. The daily Marshall





Density shall not vary from the Job Mix Design Density by more than  $\pm 1.0\%$ . Loss of stability shall be tested on other three Marshall Specimens from samples of the mix taken from behind the paver.

The assistance of the Engineer in the preparation of the job standard mix in no way relieves the Contractor of the responsibility of producing a bituminous mix meeting the requirements of the Specifications.

The compliance criteria contained in the Job Mix Tolerances provide an indication of the maximum acceptable value of the standard deviation for each parameter. If asphalt mix shows variation in excess of these limits, the source of variation shall be determined by the contractor and rectified by him to the satisfaction of the Specifications and the Engineer. If the excessive variations continue, the Engineer shall order stoppage of production and laying for the Works, until the Contractor has demonstrated his ability to re-establish acceptable control.

### 305.3 CONSTRUCTION REQUIREMENTS

#### 305.3.1 Asphalt Mixing Plant

As per Subsection 203.3.1 of these Specifications.

#### 305.3.2 Preparation of Aggregates

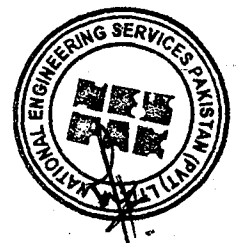
Before being fed to the dryer, aggregates for the asphalt concrete shall be separated into two or more sizes and stored separately in cold bins. One bin shall contain aggregate of such size that eighty (80) percent will pass a 2.36 mm sieve and the other bin shall contain aggregate of such size that eighty (80) percent will be retained on the 2.36 mm sieve. Should fine material be incorporated in the mix, a separate bin shall be provided in addition to the two bins mentioned above. If filler is used as a separate component it shall also be stored and measured separately and accurately before being fed into the mixer.

Asphalt cement shall be heated within a temperature range of one hundred and thirty five to one hundred and sixty three (135-163) °C at the time of mixing. All material heated above the maximum shall be considered overheated and shall be rejected and removed from job site.

Dried aggregate weighed and drawn to pug-mill shall be combined with proper amount of asphalt cement according to the job mix formula. The temperature of asphalt, except for temporary fluctuations, shall not be lower than fifteen (15) °C below the temperature of the aggregate, at the time the two (2) materials enter into the pug-mill.

In placing the materials in bins or in moving those from bins to the mixer, any method which causes segregation or uncontrolled combination of material of different grading, shall be discontinued.

Each aggregate ingredient shall be heated and dried at a temperature not to exceed



one hundred and seventy (170) degree centigrade. If aggregates contain sufficient moisture to cause foaming in the mixture or their temperature is in excess of one hundred and seventy (170) degree centigrade, they shall be removed from the bins and returned to their respective stock piles. In no case shall the temperature of an asphalt mix exceed one hundred and sixty five (165) degree centigrade when discharged from the pug-mill.

Immediately after heating, the aggregates shall be screened to required sizes and stored in separate hot bins for batching and mixing with bituminous material.

### **305.3.3 Hauling Equipment**

As per subsection 203.3.3 of these Specifications.

### **305.3.4 Laying (Spreading)**

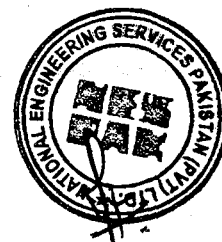
Unless otherwise directed by the Engineer, where successive layers are to be placed, the surface of existing layer shall be swept, cleaned with a power broom, or by other means as approved by the Engineer, and a tack coat is applied. Tack coat shall not be required between two lifts of Asphalt courses when previous lift is less than one day old.

Asphalt mixture shall be laid using self-contained, power-propelled units. The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The paver shall be equipped with automatic feed controls, properly adjusted to maintain a uniform depth of material ahead of the screed. It will be provided with an automatically controlled activated screed or strike-off assembly, fitted with heaters, capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and uniform thickness, required evenness and texture without tearing, shoving or gouging the mixture shown on the plans. Pavers used for shoulders and similar construction shall be capable of spreading and finishing course of Asphalt plant mix material in widths shown on the plans. The rate of delivery of material to the paver shall be so regulated as to enable the paver to be operated continuously without stoppage to ensure an even and uniform flow of material across full carriageway width, free from dragging or tearing and without segregation of the material.

When laying the mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture. The paver shall be operated at speeds which will give the best result for the type of power being used.

The mixed material shall be delivered to paver in time to permit completion of paving, finishing and compaction of mixture during day light hours.

The paver shall be equipped with automatic screed controls with sensors for either or both sides of the paver, capable of sensing grade from an outside reference line, sensing the transverse slope of the screed and providing the automatic signals



which operate the screed to maintain the desired grade and transverse slope. The sensor shall be so constructed that it will operate from a reference line or a ski-like arrangement. When the finish of the grade prepared for paving is superior to the established tolerance and, when in the opinion of the Engineer, further improvement to the line, grade, cross sections and smoothness can best be achieved without the use of the reference line; a ski-like arrangement may be substituted subject to the approval of the Engineer. The use of the reference lines shall be reinstated immediately whenever the Contractor fails to maintain a superior paving. The Contractor shall furnish and install all pins, brackets, tensioning devices, wire and accessories necessary for satisfactory operation of the automatic control equipment.

The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent variation.

Manual operation will only be permitted in the construction of irregularly shaped and or minor areas.

Whenever a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods in order to allow the contractor to use the asphalt already produced at the plant or in transit, provided this method of operation will produce results otherwise meeting the Specifications.

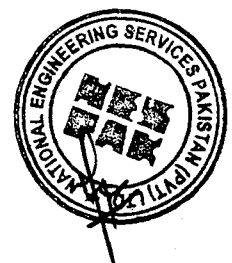
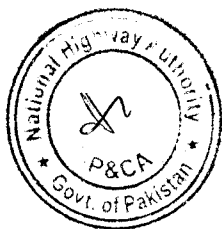
Asphalt material which is hotter than one hundred and forty (140) degree centigrade shall not be laid or deposited on bridge deck waterproofing systems unless precautions against heat damage have been agreed by the Engineer.

Asphalt concrete pavement wearing course shall not be placed on any wet or frozen surface, during rain, dust or sand storms, when wind or other weather conditions prevent the proper handling of the Asphalt mixtures or when atmospheric temperature is five (5) degree centigrade or less. Care should be taken during spreading operation under windy condition in winter, even if temperature is above five (5) degree centigrade.

The spreading operations should be immediately terminated if it begins to rain during the operation.

Hand laying of any Asphalt material will be permitted only in the following circumstances:

- a) For laying regulating courses of irregular shape and varying thickness;
- b) In confined spaces where it is impracticable for a paver to operate;
- c) For footways;
- d) At the approaches to expansion joints at bridges or viaducts;



### 305.3.5 Joints

Longitudinal joints for each course shall be offset thirty (30) centimeters from the joint in the immediate underlying course. Transverse joints shall be offset a minimum of sixty (60) centimeters from the joint of the immediate underlying course.

The Contractor will use either full width paver or two pavers in unison to avoid any longitudinal joints within the pavement width. However, where it becomes unavoidable due to break down of paver, the Contractor will ensure the leading half of half-roadway paving shall not get ahead of the trailing half of the pavement by more than half a kilometer ahead of the trailing half.

Longitudinal joints in wearing course shall, after cutting back, be of good alignment and preferably coincident with the position of carriageway markings. Except where laying in echelon, joints in wearing course shall be cut back to a vertical face and tack coated. Kerb faces, ironwork and the like in contact with wearing course shall be tack coated prior to laying of wearing course.

Longitudinal joints shall be located within fifteen (15) centimeters of the centerline of the roadway or within fifteen (15) centimeters of the centerline of a lane. Longitudinal joints shall be held to the minimum practical number. Longitudinal joints shall be formed by lapping the screed over the first layer placed, crowding a ridge of Asphalt material at the joint and crimping the ridge of material into the joint by a compaction roller while the material is hot.

Transverse joints shall be formed by cutting back the first layer placed to the full depth of the layer, removing and wasting the material, spreading new Asphalt material in sufficient quantity to create a compacted thickness equal to the thickness of the first layer. The joint shall be cross rolled with one coverage and the joint checked with a straight edge not less than four (4) meters in length. High points shall be removed and sags filled with additional Asphalt material and the joint rolled a second time. The joint shall again be checked with a straight edge, humps and sags adjusted as necessary, and rolled until the joint is complete and compacted as specified.

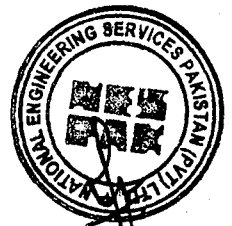
The outer edges of wearing course shall be cut back to a good alignment, parallel with the road alignment. This will require a small additional width of wearing course to be laid and cut back.

No payment shall be paid for this additional width and for all cutting back of wearing course. Tack coating of vertical faces will not be measured for payment.

### 305.3.6 Preparation of Base or Existing Pavement Surface

Before spreading materials, the surface of base or existing pavement on which the mix is to be placed shall be conditioned by application of a tack coat as specified.

After a tack coat is applied, it shall be allowed to dry until it is in the proper



condition of tackiness to receive the mix. The tack coat shall be applied only as far in advance of the placing of mix, as is necessary to obtain the proper condition of tackiness. Any breaks in the tack coat shall be repaired.

A thin coating of asphalt material shall be sprayed on contact surface of curbing, gutters, manholes, and other structures, prior to the asphalt mixture being placed against them.

### 305.3.7 Rollers

Rollers shall be steel wheel, pneumatic tyred and vibratory, or a combination thereof. The roller(s) shall be in good condition, capable of reversing without backlash, and shall be operated at speeds slow enough to avoid displacement of the asphalt mixture. The number and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. Vibratory rollers shall be acceptable for asphalt mixture compaction. The use of equipment, which results in excessive crushing of aggregate, will not be permitted.

### 305.3.8 Compaction

Asphalt material shall be laid and compacted in layer thicknesses which enable surface level and regularity requirements to be met and adequate compaction to be achieved. The maximum thickness of wearing course material laid in one pass of the paver shall be 5 cm.

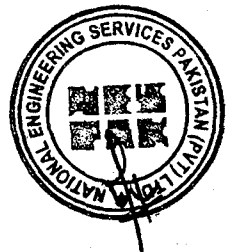
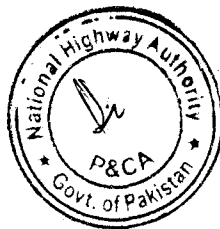
When production of the mixture can be maintained and wherever practical, pavers shall be used in echelon to place the wearing course in adjacent lanes and compacted to form a surface without lateral joint.

All mixtures shall be spread at a temperature of not less than one hundred and forty five plus/minus five (145 + 5) degree centigrade.

Material shall be uniformly compacted as soon as rolling can be effected without causing undue displacement of the mixed material and shall be substantially completed while the temperature of the mixed material is greater than hundred twenty (120) degree centigrade. Rolling shall continue until all roller marks have been eliminated from the surface.

The density achieved shall be not less than 97 percent of the Marshall Density of each day's production.

Relevant test methods for density of bituminous concrete in place by Nuclear Methods such as ASTM D 2950 (latest version) and or other method as directed by the Engineer shall be used to establish the proper rolling effort and pattern to achieve the required density and to ensure achieving the specified percent compaction during the placement of the bituminous concrete as quality control testing. A calibration factor for the Nuclear Method must be established as per the equipment's manufacture's requirements, and at any time a change is made in the



paving mixture, in construction process or after every fifteen days of asphalt production whichever is earlier. Compare the results obtained to samples compacted to Marshall Density to determine percentage of compaction.

Compaction shall be carried out using 8-10 tonne dead weight smooth wheeled rollers or by multi-wheeled pneumatic tyred rollers of equivalent mass, or by vibratory rollers or a combination of these. Wearing and base courses material shall always be surface finished with a smooth wheeled roller which may be a dead weight roller or alternatively a vibratory roller in non-vibrating mode. Vibratory rollers shall not be used in vibrating mode on bridge decks.

Vibratory rollers may only be used if they are capable of achieving at least the standard of compaction of 9-tonne dead weight roller to meet the specified percent compaction of Marshall Max. Density, and shall be equipped or provided with devices indicating the frequency at which the mechanism is operating and the speed of travel which can be read from the ground.

Three steps of rolling are as follows:

**i) Breakdown Rolling**

Breakdown Rolling may be accomplished with static or vibratory steel-wheeled rollers.

It is important to start the rolling operation on the low side of the mat (usually the outside of the lane being paved) and progress toward the high side. The reason is that hot mixtures tend to migrate toward the low side of the mat during compaction. If rolling is started on the high side, migration is much more pronounced than if rolling starts from the low side. When adjoining lanes are placed, the same rolling procedure should be followed but only after compaction of the longitudinal joint.

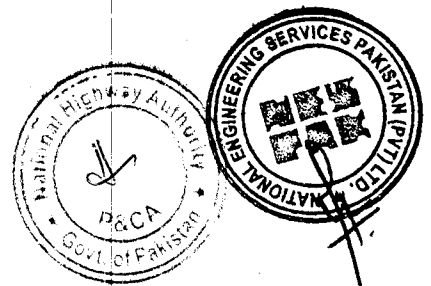
**ii) Intermediate Rolling**

Intermediate rolling should follow breakdown rolling as closely as possible, while the asphalt mix is still well above the minimum temperature at which densification can be achieved.

Intermediate rolling should be continuous until all of the mix placed has been thoroughly compacted. Regardless of the type of rollers used, the rolling pattern should be developed in the same manner as for breakdown rolling.

**iii) Finish Rolling**

Finish rolling is done solely for the improvement of the surface. It should be accomplished with steel-tired, static-weight tandems or vibratory tandems without vibration while the material is still warm enough for removal of roller marks.



The material shall be rolled in a longitudinal direction with the driven rolls nearest the paver. The roller should first compact the material adjacent to any joints and then work from the lower to the upper side of the layer overlapping on successive passes by at least half the width of the rear roll or in the case of a pneumatic tired roller, at least the nominal width of one tyre.

The smoothness of the surface and its good acceptable ride-ability as specified shall be adhered. Following points need special attention:

- a) Variation in the surface on which the asphalt course is laid shall be free from variations and be well within the allowable tolerances.
- b) The asphalt laid through the pavers will be checked immediately after initial rolling and defects will be rectified as required.
- c) Frequent stopping/starting of paver is not allowed. Paver speed should be adjusted to average rate of delivery of material, even if some trucks are delayed in dumping loads. If stop cannot be avoided, the section of pavement at the location of stop should be checked by straightedge before and after compaction.
- d) Joint should be checked with a straightedge immediately after construction and corrections made while the material is still hot. All corrections should be made with a lute. Rakes should be used only for loosening material. Poor joints must be corrected immediately, later grinding of high spots is a poor substitute for proper construction.
- e) The paver should be adjusted so that back casting of fill in low spots is not required.
- f) Irregular rolling or letting the roller stand on hot pavement is not allowed.
- g) Non-uniform asphalt mixture shall not be allowed.
- h) Pulling of mat by screed of the paver is not allowed. This results in regularly spaced, very small, cracks in mat. The compacted mat is thinner in the vicinity of cracks due to lack of material, resulting in a corrugated surface.
- i) If the truck brakes are set too hard or the paver is bumped by a truck, irregularities occur. Truck should stop before hitting the pavers.
- j) Non-uniform temperature of material is not allowed. Cold loads do not compact to the same thickness as hot loads. The temperature of each load should be checked for uniformity as per specifications before dumping.
- k) Frequent adjustment of screed controls is undesirable. Sometimes paver crews constantly change the screed controls manually in order to maintain a uniform thickness. The result is poor riding quality.



l) Ridability of the paved surface shall be checked regularly as per 305.3.10.2.

### 305.3.9 Trial Areas

At least 3 days before material from each source of the asphalt concrete is first laid in the Works, the Contractor shall lay a trial area to demonstrate the compaction plant and rolling procedure selected by him for achieving the specified density.

- a) The trial shall be not less than 200 m in length and of a width to be approved by the Engineer. If the trial area complies with these Specifications it may form part of the permanent Works;
- b) For the trial the Contractor shall use the materials, mixing and laying plant proposed for the main works.

Where the required level of compaction is not achieved the trial area shall be removed and the trial repeated.

The Engineer shall approve test results and general performance of test area before actual commencement of the work.

### 305.3.10 Surface Tolerances

#### Surface Test by Straightedge

After completion of final rolling, the finished surface shall be tested for smoothness with five (5) meters straightedge by the Engineer at selected locations. The variation of surface from testing edge of straight edge between any two (2) contacts shall be determined by placing it parallel and perpendicular to centerline of roadway and value thus determined should not vary more than limits prescribed by "Table for Allowable Tolerances" in these Specifications.

#### Removing and Replacing

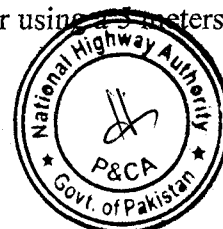
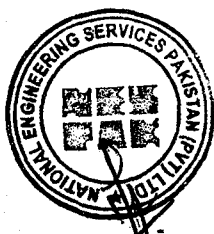
Corrections may also be made by removing the defective asphalt layer and replacing it by asphalt concrete meeting the specified requirements.

### 305.3.10 Wearing Course Thickness Tolerance

The asphalt concrete wearing course shall be compacted to the desired level and cross slope as shown on the drawing or as directed by the Engineer.

The tolerances in compacted thickness of the wearing course shall be  $\pm 3$  mm from the desired thickness shown on the drawings. For determination of thickness one (1) core per hundred meters of each lane will be taken. If the thickness so determined is deficient by more than three (3) mm, but not more than ten (10) mm, payment will be made at an adjusted price as specified in Table-1, clause 305.4.2.(2) of these Specifications.

The surface of the wearing course shall be tested by the Engineer using 5 meters





straightedge at selected locations. The variation of the surface from the testing edge of the straightedge between any two contacts, longitudinal or transverse with the surface shall at no point exceed four (4) millimeters. The cross fall (camber) shall be with  $\pm 0.2$  percent of that specified, and the level at any point shall be within  $\pm$  three (3) mm of the level shown on the Drawings. All humps or depressions exceeding the specified tolerance shall be corrected by removing the defective work and replacing it with new material, by overlaying, or by other means satisfactory to the Engineer.

### **305.3.11 Acceptance of Sampling and Testing**

The Engineer shall perform or supervise the performance of all quality assurance sampling and testing. The location of all samples and tests shall be recorded by roadway, lane and centerline station (kilometer).

Acceptance of sampling and testing for this item with respect to materials and construction requirements, not specified herein, shall be in accordance with the relevant "Tables for Sampling and Testing Frequency" in these Specifications.

### **305.3.12 Surface Smoothness**

The completed asphalt wearing course shall be compacted as specified, smooth, free from ruts, humps or depressions, or irregularities. Any ridges, indentations, roller checking, or other objectionable marks left in the surface, as determined by the Engineer, shall be eliminated by whatever means are necessary and approved by the Engineer. The use of any equipment that leaves ridges, indentations or other objectionable marks shall be discontinued.

Allowable tolerances for riding quality/smoothness of finished asphalt concrete wearing course are stated in "Table for Allowable Tolerances" and Subsection 305.3.10 in these Specifications.

### **Frequency of Testing of Cores for Compaction**

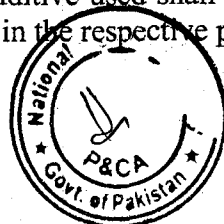
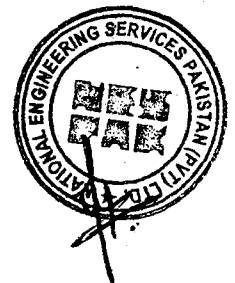
As per Subsection 203.3.9 of these Specifications.

## **305.4 MEASUREMENT AND PAYMENT**

### **305.4.1 Measurement**

The quantity of asphalt concrete wearing course shall be measured by volume in cubic meters laid and compacted in place. Measurements shall be based on the dimension as shown on the Drawings or as otherwise directed or authorized by the Engineer. No measurement shall be made of unauthorized area or extra thickness. Quantities of material wasted or remaining on hand after completion of the work shall not be measured or paid for.

Any asphalt additive used shall not be paid directly. Its payment shall be deemed to be included in the respective pay item of Asphalt Concrete Wearing Course.



**305.4.2 Payment**

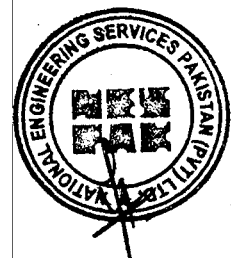
- 1) The quantity determined as provided above shall be paid for at the contract unit price respectively for each of the particular pay items listed below and shown in the Bill of Quantities, which prices and payment shall constitute full compensation for all the costs necessary for the proper completion of the work prescribed in this item. Asphalt additive or anti-stripping agent, if allowed and used to meet with JMF requirement shall not be paid directly, payment shall be deemed to be included in the respective pay items of Asphaltic wearing course.
  
- 2) **Price adjustment:** If the thickness determined as per clause 305.3.11 of this specification is deficient by more than three (3) mm, but not more than ten (10) mm, payment will be made at an adjusted price as specified in Table-1 below:

**Table - 1**

Deficiency in thickness as determined by cores	Proportional Rate of contract Price allowed
0.0 mm to 3.0 mm	100%
3.1 mm to 5.0 mm	90%
5.1 mm to 10.0 mm	80%

When wearing course is more than ten (10) mm deficient in thickness, the contractor shall remove such deficient areas and replace them with wearing course of an approved quality and thickness or the Contractor may opt to place an additional layer of wearing course asphalt, grading with a minimum thickness of 35 mm. The Contractor will receive no compensation for the above additional work.

Pay Item No.	Description	Unit of Measurement
305a	Asphalt Wearing Course Class A	CM
305b	Asphalt Wearing Course Class B	CM



**ITEM 401 CONCRETE**

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**401.1.2 TYPES OF CONCRETE**

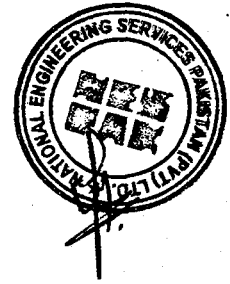
“On Ground Concrete”

In line one (1) add “minimal” after erecting. Add at the end “However walls for culvert shall be considered in elevated concrete”.

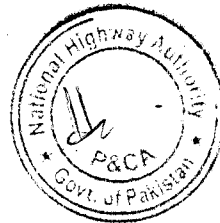
**401.4 MEASUREMENT AND PAYMENT**

**401.4.1 Measurement**

In para three (03) add at the end “against per cu.m of concrete”.



# Special Provisions



**SP 117a      FORMATION OF GRANULAR MATERIAL PLATFORM**

**117.1      DESCRIPTION**

This work shall consist of the formation of embankment in areas of soft embankment foundation, high water levels, where compaction of natural ground is unable to achieve the density required in Item 104 with the prescribed general method. This would also include the wet areas which cannot be dried by scarifying or other measures and which exhibit moderate to severe heaving of surface during proof-rolling.

The embankment shall consist of a working platform of the granular material followed by the embankment fill material at toe of the embankment, all placed in accordance with these specifications and the specifications for other work items involved and in conformity with the lines, grades, sections and dimensions shown on the drawings or as directed by the Engineer's Representative.

**117.2      MATERIAL REQUIREMENTS**

**117.2.1      Subgrade/Embankment**

The subgrade/embankment material shall be as per Clause 109 and 108 respectively of General Specifications.

**117.2.2      Granular Material Platform**

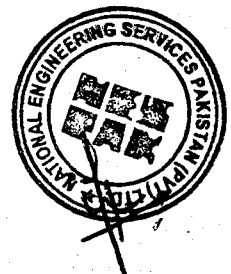
The material for the working platform shall consist of normal or processed granular fill material obtained from borrow excavation or quarry waste. This material shall conform to the following Specifications:

Size	%age of Weight Passing Mesh Sieve AASHTO T-27
37.5 mm	100
10 mm	75 - 100
# 4	60 - 80
# 10	45 - 65
# 40	25 - 40
# 100	0 - 15
# 200	0 - 5

It shall also be checked that selected grading is such that intrusion into the working platform material of subgrade or natural ground surface material is not allowed. For this condition to be met it will be required that the ratio as below shall be checked and followed:

$$\frac{D15 - (\text{Granular Fill Material})}{D85 - (\text{Natural Ground Material})} < 5$$

D85 and D15 mean the practical diameters corresponding to 85% and 15% respectively, passing (by weight) in a grain size analysis.



### 117.3 CONSTRUCTION REQUIREMENTS

#### 117.3.1 Subgrade/Embankment

The subgrade / embankment above the granular material platform shall be compacted to 95% AASHTO T-180 D regardless of zone of embankment within which it falls.

#### 117.3.2 Granular Material Platform

Prior to laying of granular material platform, the pond water of water logged area upon which embankment is to be placed, shall have been dried and drained or kept drained of all surface water prior to commencing of fill and all clearing and grubbing shall have been performed, manually if necessary, in accordance with the relevant specifications.

Construction of the granular fill layer shall proceed from one end of the soft area by using the granular fill as a ramp for further granular fill transport. The thickness of the granular fill working platform, as prescribed shall be as shown on the Project drawings or as directed by the Engineer's Representative and the width shall be that of the embankment or part as directed by the Engineer's Representative. The placement and compaction of the working platform including boxing material shall be carried out by the use of appropriate light equipment, in layers, if necessary. The placement, spreading and compaction of the Granular Material Platform shall be carried out by using light equipment. The top 15 cm of the platform shall be compacted to at least 90% AASHTO T-180 density.

In those areas of high water levels and salinity with soft subsoils and where embankments are high such as approach fills to structures, special provisions shall be made to measure and determine likely fill settlements which may occur. These preconditions are necessary in order to specify particular construction procedures which may be necessary and to establish the time at which the pavement structure can be placed to avoid cracks and subsidence of these layers.

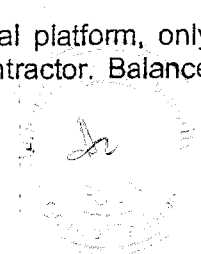
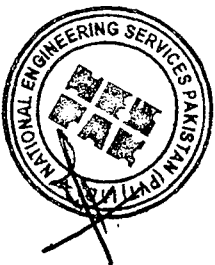
In particular, additional compaction of the fill material and its adequate protection shall be required to prevent and underscore the risk of "collapse" settlement.

No extra payment under this item shall be made to the Contractor for re-working, re-instatement, replacement of granular material which has become slushy, or replenishing of granular material for whatever reason.

### 117.4 MEASUREMENT AND PAYMENT

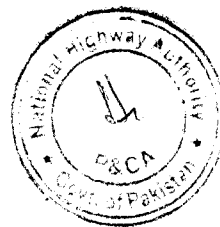
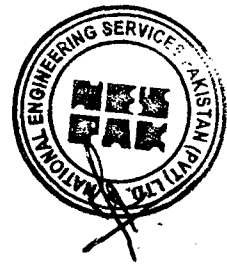
The quantities measured against this item as shown on the drawings with respect to line and grades shall be paid for at the contract unit price for the pay items listed below and shown in the Bill of Quantities. These prices and payments shall constitute full payment and compensation for providing including hauling, processing, placing at site and compacting as specified, replenishing granular material for remedying loss of material due to traffic and sinking of granular material platform during construction due to whatever reason, including all equipment, labour, material and all other costs related to the completion of works in all respects.

On first-time completion and approval of granular material platform, only 75% payment for pay item SP 117a shall be made to the Contractor. Balance 25%



payment for pay item SP 117a shall be made to the Contractor only when the granular material platform is no more required to serve as detour road and it has been re-worked, re-instated or replaced as directed by the Engineer's Representative and is re-approved and ready to receive oncoming layer of embankment.

Pay Item No.	Description	Unit of Measurement
SP-117a	Formation of Granular Material Platform.	CM



SP 117b      FORMATION OF EARTHEN DOWEL

---

**117.1 DESCRIPTION**

This work shall consist of construction of earthen dowel at shoulder edge on both sides of carriageway as shown on the drawings and or as directed by the Engineer.

**117.2 MATERIAL REQUIREMENTS**

The material for earthen dowel shall be any suitable soil obtained from roadway excavation, borrow excavation or any other source as approved by the Engineer having a plasticity index of 6 or more. The material shall conform to the requirements of clause 108 of the specifications. It should be free of organic and other deleterious substances.

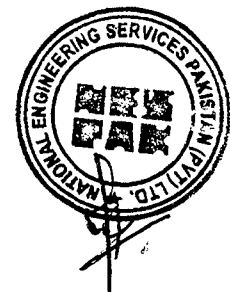
**117.3 CONSTRUCTION REQUIREMENTS**

The earthen dowel shall be constructed at shoulder edge on both sides of carriageway as per dimensions shown on drawings or as directed by the Engineer. No specific density requirements are specified for earthen dowels, it shall be as directed the Engineer. Preferably they shall be graded and compacted with at least two passes of vibratory roller to the satisfaction of the Engineer.

**117.4 MEASUREMENT AND PAYMENT**

The quantities measured against this item as shown on the drawings with respect to line and grades shall be paid for at the contract unit price for the pay items listed below and shown in the Bill of Quantities. These prices and payments shall constitute full payment and compensation for providing including hauling, processing, placing at site and compacting as specified including all equipment, labour, material and all other costs related to the completion of works in all respects.

Pay Item No.	Description	Unit of Measurement
SP-117b	Formation of Earthen Dowels.	CM



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**SP-414 SOIL INVESTIGATIONS AT BRIDGE SITES**

**414.1 SCOPE OF WORK**



The Contractor shall carry out confirmatory boring at bridge and Flyover sites at locations marked on the drawings or as directed by the Engineer's Representative.

The purpose of the Work specified herein is to determine the type, nature, arrangement, thickness and texture of the various subsurface strata, the conditions and the Engineering characteristics of the subsurface materials as they exist to the depth and at the locations specified. This is to be accomplished by means of drilling, in-situ testing, collection of disturbed and undisturbed soil and water samples and laboratory testing.

The Contractor shall carry out the specified works under the supervision of the Engineer's Representative.

#### **414.1.1 Plant and Equipment**

The Contractor shall keep at-least one rotary drill machine and one percussion winch along with accessories on the site to meet the requirements of the Work. The plant and equipment shall be in good operating condition and capable of performing efficiently the Work as set forth.

#### **414.1.2 Drillers and Supervisory Staff**

The Contractor shall provide qualified, experienced, orderly and thoroughly competent persons at all times including geotechnical engineers or engineering geologists who shall conduct and supervise drilling, sampling, logging and in-situ testing at the site. The Contractor shall remove any of his employees from the site that in the opinion of the Engineer does not meet these requirements.

The Contractor shall make his own arrangements for housing of his personnel, security and storage of the equipment and supplies at the site.

#### **414.1.3 Setting up at each Hole**

The Contractor shall make all the necessary arrangements for setting-up plant and equipment at each location, carrying out the work specified, preparation and reinstatement of the work areas, improvement to access routes and all other temporary works.

#### **414.1.4 Measurement of Quantities**

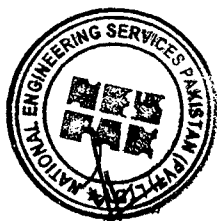
The quantities shown in the Bill of Quantities are only approximate. The payment shall be made on the basis of actual work performed in accordance with the Specifications.

#### **414.1.5 Submission of Field and Laboratory Data**

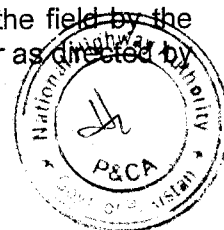
The Contractor shall supply complete field and laboratory investigation data to the Engineer's Representative within the time set-forth for completion of works. This data shall include copies of all the approved logs and test records provided during the course of the Contract including any alterations or amendments required by the Engineer's Representative.

#### **414.1.6 Location of Investigation Points**

- a) The locations of investigation points shall be established in the field by the Contractor on the basis of the Drawings to be provided later or as directed by



414.1.6



the Engineer's Representative. Locating the boreholes accurately in the field shall be the sole responsibility of the Contractor.

- b) It is to be understood that further Drawings may be issued by the Engineer showing the revised locations of investigation points.
- c) All the investigation points shall be located by the Contractor through field survey to an accuracy of 1 m in plan and 0.05 m in ground elevation.

## **414.2 WORK METHODOLOGY**

### **414.2.1 Investigated Areas**

The location of the boreholes will be selected as directed by The Engineer. The Engineer will specify from time to time during the Contract period, the exact location and reference number of all holes. To locate the holes accurately in the field shall however be the Contractor's responsibility.

### **414.2.2 Casing**

A hole shall be cased in any stratum which is friable or not sufficiently strong to stand unsupported, or as and when directed by the Engineer's Representative.

The Contractor shall ensure that casings are of a suitable size and inserted in such a manner as to render them recoverable. The Contract Rates for drilling shall be deemed to include the supply, insertion and recovery of casing including any damage, loss or delay caused by difficulty or failure in recovering casing.

### **414.2.3 Removal of Casing**

Casing shall neither be removed from any hole nor any filling introduced into it until permission is given by the Engineer. This permission will normally be given as soon as work in the hole is completed and the groundwater level has been measured.

As far as possible the Contractor shall avoid leaving a hole overnight after he has begun to withdraw the casing and before he has finished.

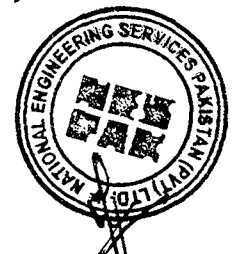
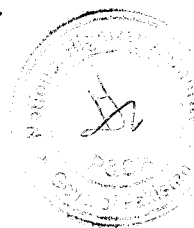
### **414.2.4 Supplementary Holes**

Abandoned holes and / or the holes from which unsatisfactory samples have been obtained and/or in which unsatisfactory field tests have been performed due to the negligence of the Contractor shall be supplemented by other holes adjacent to the original location. The exact location of such supplementary holes shall be specified by the Engineer in the field.

The depth where the unacceptable holes were abandoned or to the depths where unsatisfactory samples were obtained or unsatisfactory field testing was performed may be made by any method selected by the Contractor that in the opinion of the Engineer will permit satisfactory field testing and sampling below those depths at which original hole was abandoned shall be carried out using only the specified method of advancing the hole.

No payment will be made for that portion of the supplementary hole above the depth paid for in the unacceptable hole.

### **414.2.5 Groundwater Level**



The groundwater level in holes shall be determined after completion of the hole or when required by the Engineer, as follows:

Clear water shall be added or the hole shall be bailed-out as necessary to bring the water level to the expected groundwater level as directed by the Engineer and the water level shall be measured and recorded at intervals of 6 hours for a period of twenty four (24) hours thereafter.

#### 414.2.6 Backfilling Holes

Boreholes shall be backfilled with grout as directed by the Engineer.

Grouting for backfilling holes shall consist of a mud formed by mixing one (1) part by weight of bentonite with ten (10) parts of water, to which two parts by weight of cement shall be added after the bentonite and water have been thoroughly mixed. Alternatively, holes may be backfilled with purpose-made pellets of bentonite or bentonite/cement, provided they are of a size which, in the opinion of the Engineer, is compatible with the size of hole. If there is no standing water in the hole, grout may be poured in from the top. If there is standing water in the hole, the grout shall be fed into the bottom of the hole by a tremie pipe, the end of which shall always be below the groundwater junction while grouting is being carried out.

Grout backfill shall be taken up to 30 cm below the original ground level. Any apparent loss of grout due to leakage or consolidation within one week shall be made-up with fresh grout and then the remaining depth of the hole shall be filled with concrete.

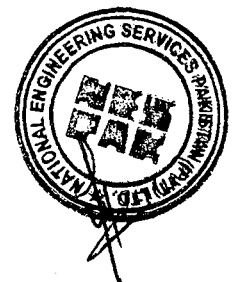
#### 414.2.7 Logs

Logs of boreholes shall be provided on an approved specimen. These shall include descriptions of all strata including details of the soil macrofabric (such as frequency, orientation and nature of fissures) and details of samples taken, and an account of all observations and field tests. Logs of boreholes shall include notes on the nature, quantity and colour of the drilling fluid returns. All logs shall be subject to the approval of the Engineer and two draft copies shall be submitted to the Engineer, not more than two days after the hole is backfilled. Soil descriptions shall conform to ASTM designation D 2488 and classified according to ASTM designation D 2487. All depths and thicknesses of topsoil and strata shall be recorded in meters and all reduced levels shall be recorded in meters with reference to Survey of Pakistan datum. Accurate determination of ground levels at all the hole points is the Contractor's responsibility for which no extra payment shall be made.

#### 414.2.8 Contractor's Responsibility for Records

The presence of the Engineer or any of his staff and their keeping separate drilling records shall not relieve the Contractor of any of his responsibilities for keeping records.

#### 414.2.9 Order of Work



The order in which the work is to be accomplished shall be determined and approved in the field by the Engineer.

#### 414.3 DRILLING

##### 414.3.1 Depth of Drilling

Drilling would generally be required up to a minimum of 45 meters depth or at least 5 m below the pile tip level, whichever is more or as directed by the Engineer.

##### 414.3.2 Accuracy of Alignment of Holes

Boreholes will be within 2 degrees of the vertical unless the Engineer's Representative has ordered the drilling of an angled hole in which case the hole angle shall be within 5 degrees of the angle specified.

##### 414.3.3 Drilling Plant

The drilling plant and ancillary equipment to be mobilized at the site should be adequate to advance the boreholes in an efficient manner, to the required depths.

Rotary drilling rigs shall be of the hydraulic feed type equipped with side discharge type fish tail and tricone bits for drilling. Bits and casing shall conform to B.S. 4019; Part I; 1974 or an approved equivalent.

Drilling bits shall be of side discharge type designed to prevent unnecessary disturbance of soil at bottom of the hole by flow of drilling fluid, unless the Engineer directs otherwise.

##### 414.3.4 Drilling Procedure

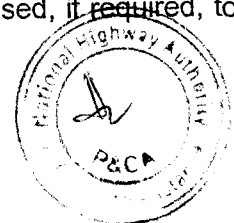
The method of drilling shall be of any approved standard and accepted method by means of which a hole of specified diameter is extended to the desired depth. The normal method of drilling shall be rotary unless gravelly strata are encountered where percussion may be used.

During drilling the Contractor shall regulate the drilling operation which ensures minimum disturbance in the underlying material in which the in-situ testing and sampling is to be carried out.

In rock, core drilling shall be carried out in such a manner and using such sizes of bits, that the maximum core is recovered. This requires close surveillance of the flushing media, drilling pressures, lengths of runs, use of appropriate core barrels and other factors relevant to the nature of the material drilled. The drill bit shall be withdrawn and core removed as often as may be necessary to secure the maximum possible amount of core. In soft or friable formation, dry drilling techniques may be required using single tube core barrel with tungsten carbide bits as directed by the Engineer. The cores would be placed in core boxes in a proper manner.

##### 414.3.5 Stabilizing of Holes

Drilling mud of suitable consistency shall be used during rotary cum wash boring to stabilize the walls of boreholes by preventing caving-in and to avoid disturbance of the sampling horizons. The drilling mud shall be a mixture of bentonite and water with approved chemical additives being used, if required, to



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NATIONAL HIGHWAY AUTHORITY**

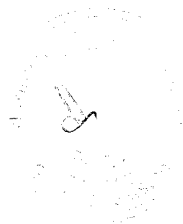


**OCB/CAREC/T-III:**

**Construction of Additional Carriageway from Rajanpur – DG Khan N-55 Highway Section (121.5 Km) and DG Khan – DI Khan N-55 Highway Section (208.0 KM) from Two-Lane to Four-Lane Under one Package Comprising of Four Lots**

- *Lot-4: Tibi Qaisrani to DI Khan via Ramak Section (96.245Km)*

**PARTICULAR SPECIFICATION/  
SPECIAL PROVISIONS**



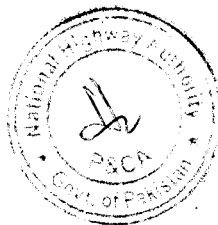
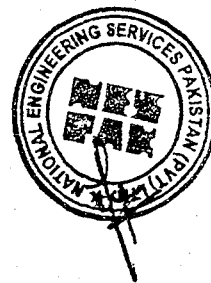
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# Particular Specifications



## ITEM 107 STRUCTURAL EXCAVATION AND BACKFILL

### 107.1 DESCRIPTION

In line 12, add at the end:

This includes excavation below original ground and back filling with granular or select fill. All common backfilling above the level of the original ground shall be payable under Item 108.

Delete 107.2.1, 107.2.2 and replace with the following.

#### 107.2.1 Backfill around Structure

Backfill around or below structure shall be made with the following material.

- a) Granular backfill / Select Fill material as specified hereunder
- b) Common backfill shall be carried out from excavated material or any other borrow material approved by the Engineer.

#### 107.2.2 Granular backfill/Select Fill

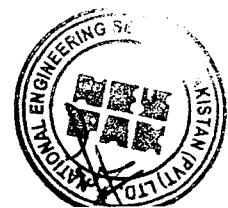
Granular backfill/Select fill material shall meet the following requirements:

##### a) Grading Requirement

mm.	inch	% passing
25	1"	100
19	¾"	60-100
4.75	No. 4	50-80
2.0	No. 10	40-70
0.425	No. 40	25-45
0.075	No. 200	0-15

Material satisfying the requirements of coarse sand falling under soil classification A-3 (AASHTO). In case, coarse sand is utilized for granular fill it shall be ensured that the same is confined properly with approved material.

- b) The material shall have a Plasticity Index of not more than six (6) as determined by AASHTO T-89 and T-90





### 107.2.3 Common Backfill

In line 3, add after "Engineer" "as per the material requirements in Section 108.2".

Add Subsection 107.2.5

### 107.2.5 Requirement of Select Fill Material Below Structures' Foundations

Requirement of Select Fill material below structures' foundations shall be as per 107.2 or as directed in writing by the Engineer.

## 107.3 CONSTRUCTION REQUIREMENTS

### 107.3.1 Structural Excavation

#### a) General

Delete para 3, and add the following:

"The Contractor shall notify to the Engineer well in advance about the start of any structural excavation which constitute a pay item in the Bill of Quantities. The Engineer shall observe the cross-sectional elevations and measurements taken for the existing ground in the area of the structure. Any material removed or excavated before these measurements and approved by the Engineer will not be paid.

The Contractor shall minimize, to the extent possible, the length of time that excavated areas are open. He shall be solely responsible for damages due to weather, equipment, accidents, or other causes when excavation is left open. In this regard the Contractor shall take all required precautionary measures such as barriers, barricades and warning signs etc.

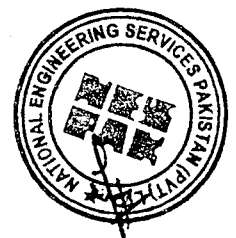
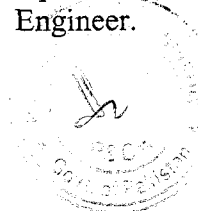
#### d) Preparation of Foundations of Footings

In para (ii), line 2, delete "special, care" and replace with, "special care".

At the end, add para (iii) and (iv) as follows:

iii) Foundation material on which structure is to be placed shall be compacted as per clause 107.3.3 unless otherwise directed by the Engineer.

In case unsuitable material (as per clause 108.2e) is encountered at foundation level shall be removed to the depth and extent as directed and replaced with suitable material of the type as determined by the Engineer.



iv) (a) Placement of Select Fill

All vegetation, topsoil and other unsuitable materials shall be removed. Prior to placement of the first layer of select fill, the ground surface shall be compacted as given in Section 104.2.

(b) Compaction of Select Fill

The select fill material shall be placed in layers of thickness appropriate to the type of compaction equipment and compacted to meet the following minimum requirements of compaction at OMC (-2%) to + 1 % of OMC):

- 95 % M.D.D as per AASHTO T 180 or
- 74 % Relative Density as per ASTM-D 4253/4254.

f) Pumping

Add the following in the beginning

Care shall be taken during excavation to prevent disturbance to the foundation. If ground water is encountered during excavation and a concrete seal course is not to be used, dewatering shall be commenced and shall proceed in advance of or concurrently with further excavation. The foundation shall be free of water at the time, footing concrete is placed and water control shall continue as necessary to prevent damage to the work.

All dewatering shall be performed at the Contractor's sole expense and shall be considered as included in the contract unit price(s) for the facility being constructed. The sides of excavations shall be sloped as required by soil conditions to stabilize the sides for safe working conditions. The quantities of excavations for said sloping will not be measured for payment. The backfilling shall be done with suitable materials as approved by the Engineer, at Contractor's expense.

h) Classification of Excavation

Delete the whole paragraph

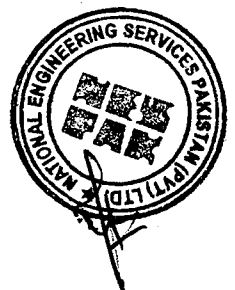
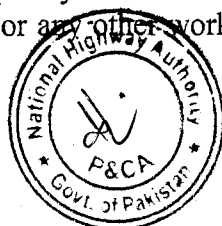
**107.3.2 Excavation in Embankments**

In para 3, line 3, delete "also" and substitute with "Also"

**107.3.3 Backfill**

Add the following para at the end:

Any temporary backfill or platform constructed by the Contractor for piling purposes or any other work item(s), its preparation, construction and removal



of this work by the Contractor shall not be measured for payment. Its cost shall be deemed included in the respective pay item.

**107.4 MEASUREMENT AND PAYMENT**

**107.4.1 Measurement**

a) Structural Excavation

In para 1, line 2, between "position" and "computed" insert "below top soil"

Add at the end of para (1) the following:

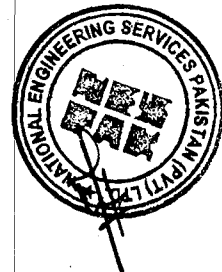
However the stability of the structural excavation shall be the responsibility of the Contractor for which he may use any appropriate means including shoring and / or excavation along a suitable slope line without any extra payment.

In para 3, sub-para (1), add at the end:

"Neat lines of footings or foundations shall mean the outer faces of footings or foundations excluding lean concrete.

After para 4, at the end, add the following para:

"No separate payment shall be made for compaction of excavated foundation under structures".



## ITEM 108 FORMATION OF EMBANKMENT

### 108.1 DESCRIPTION

Add at the end of para.

The work shall also include the compaction, trimming and shaping of the side slopes as shown on the plans and removal of any excess fill as directed by the Engineer prior to placement of top soil on slopes of the embankment where required.

### 108.2 MATERIAL REQUIREMENTS

Add the following at the end of 1<sup>st</sup> para.

Wet excavated material which will be suitable when dry and if approved by the Engineer shall first be allowed to dry before being placed in the embankment. If the Contractor wishes to replace the wet (suitable) material with dry material that can be easily compacted to the required density to save his time, the same shall be done at no extra cost to the employer.

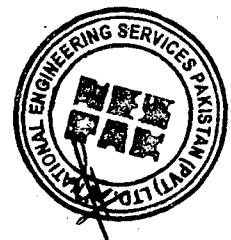
b) Delete and replace with following table;

CBR of the material with regard to depth of embankment shall be as follows

Depth of Embankment	CBR at 95% MDD
0 – 30 cm	25%
Below 30 cm	7%

Add after (d)

- e) In case non-cohesive material is used for embankment formation, it shall be properly confined at no extra cost, with a cohesive material having Liquid Limit not more than 25 and Plasticity Index not more than 6 or as approved by the Engineer.
- f) For the purpose of embankment and subgrade construction the following shall be considered as unsuitable materials:
- 1) AASHTO soil classification group of A6 and A7;
  - 2) Material from swamps, marshes and bogs;
  - 3) Peat, logs, stumps, garbage and perishable materials;
  - 4) Material susceptible to spontaneous combustion;
  - 5) Organic Soils, as determined by ASTM D 2487-83 or USBR Earth Manual.



- f) The moisture content of the soil at the time of compaction shall be optimum to achieve the compaction up to the specified density. The maximum dry density and optimum moisture content shall be determined from moisture density test (AASHTO T-180 Method D) performed on different type of soil to be used in the construction of the work. Optimum moisture content and the moisture range required for the soil to achieve the desired compaction shall be approved by the Engineer. The soil shall be compacted at optimum moisture content with +1 % to -2 % tolerances, commensurate with the soil type, unless otherwise directed by the Engineer.

When compaction is determined by "Relative Density Test" then tolerance for moisture content shall be finalized during the compaction trial and approved by the Engineer.

### **108.3 CONSTRUCTION REQUIREMENTS**

#### **108.3.1 Formation of Embankment with Borrow Common Material**

After 1<sup>st</sup> para add following:

If suitable material is not available in the Project area, the Contractor shall blend granular material with locally available soils which are otherwise unsuitable (as per category 1 of 108.2e), to achieve a uniform blend that meets the material requirements stated above without any additional cost to the Employer. Such widely divergent materials may be mixed, sampled and tested outside the embankment limits and the mixture may be used as a proposed source of borrow material as outlined in Section 108.2. However, the Contractor will submit his method statement to the Engineer and get it approved before proceeding with the work. Approval of this method statement by the Engineer shall not relieve the Contractor of his responsibility to use the suitable material in the Works. Material for embankment, obtained and approved as provided above, shall be placed in horizontal layers of uniform thickness and in conformity with the lines, grades, sections and dimensions shown on the Drawings or as required by the Engineer. The layers of loose material other than rock shall be not more than 20 cm. thick, unless otherwise allowed by the Engineer after a trial section is prepared and approved for each material source and/or borrow area.

Delete para 7

Delete last para and replace it with the following:

Side slopes shall be neatly trimmed to the lines and slopes shown on the drawings or as directed by the Engineer, and the finished work shall be left in a neat and acceptable condition. The slopes of the design road cross-section shall be trimmed and compacted to the densities as specified above for different zones". No surplus material shall be permitted to be left at the toe of embankment or at the top of cut section.

#### **Relative Density Test**

For cohesion-less free-draining soils for which impact compaction will not produce a well-defined moisture density relationship curve and the maximum density, Test



for Relative density of Cohesion-less soils ASTM D-4253/4254 shall be used to determine the relative density.

Relative density is defined as the state of compactness of a soil with respect to the loosest and densest state at which it can be placed by the laboratory procedures described in the ASTM D-4253/4254. The field Density and actual Moisture Content of the compacted embankment shall be determined by field tests according to AASHTO T 191.

### 108.3.5 Formation of Embankment in Water Logged Areas

Delete 1<sup>st</sup> and 2<sup>nd</sup> paras and replace with the following:

In places where excessive moisture is encountered in natural ground and movement of heavy machinery is not possible as it creates soft spots and movement in ground, all such areas shall be left undisturbed for such period that the top surface dries up and forms a crust. The Contractor shall prepare a moisture profile up to a depth of 1.5 meters.

A blanket layer of 60 cm or more (up to one (01) meter) shall be placed in two lifts in the following manner:

- Material stocked at one end of the subject area.
- The material is then pushed by dozer making a lift of 30 cm. (or half the thickness of total lift)
- The dozer should only move on the spread material making sure that no machinery shall move on natural ground.
- After completing one stretch, the area is proof rolled. Material for 2<sup>nd</sup> lift is again stocked at one end and pushed by dozer in the similar manner as 1<sup>st</sup> lift.
- After completing the 2<sup>nd</sup> lift, the top 15 cm is compacted to 90% of maximum dry density.
- Vibration of roller shall not be allowed on blanket layer in any case.
- After approval of this layer, further filling shall be carried out as per standard procedure of 15 cm compacted layer.

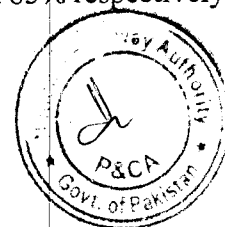
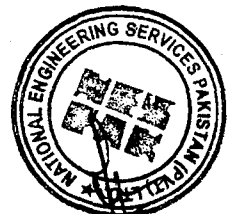
The material of blanket layer/working platform shall be as per clause 108.2 (d) and paid under item 108 c.

It should also be checked that selected grading is such that intrusion into the blanket/working platform material of sub-grade or natural ground surface material is not allowed.

For this condition to be met it will be required that the ratio as below shall be checked and followed:

$$\frac{D15 - (\text{Granular Fill Material})}{D85 - (\text{Natural Ground Material})} < 5$$

D15 and D85 mean the particle diameters corresponding to 15% and 85% respectively, passing (by weight) in a grain size analysis.



At the end of clause 108.3.5 add the following:

When the roadway profile is so low that after construction of the lower part of the embankment using a "bridging lift" will not permit the placement and compaction of fifty (50) centimeters of acceptable embankment material, Contractor shall prepare a proposal to raise profile of the embankment and submit it to the Engineer for his approval.

Boulders and rock fragments larger than twenty (20) centimeters in maximum dimension shall not be placed in the embankment any closer than fifty (50) centimeters from top of the subgrade.

Embankment settlement period for critical section, where height is greater than 5.0 meter, is approximately three (3) months. Embankment therefore, shall remain in place for the required settlement period before placing the 30 cm thick subgrade layer.

### **108.3.6 General Requirements**

At the end add the following:

Embankment filling shall be brought up and compacted over the full width of the embankment of the carriageways in one operation in layers parallel with the sub-grade level. At no time shall any part of the embankment width under one carriageway be left more than one layer lower than any other part of the embankment width.

Shoulder construction shall be brought up simultaneously with the pavement construction. In order to prevent water penetration into the pavement layers during construction, shoulder and median construction shall be brought up simultaneously with the pavement construction.

Embankment side slopes shall be neatly trimmed to the lines and slopes shown on the drawings or as directed by the Engineer and the finished work shall be left in a neat and acceptable condition.

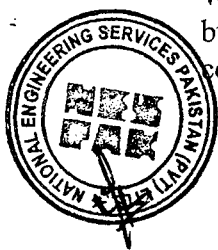
### **108.3.7 Formation of Embankment with A-3 Material**

The construction of embankments with A-3 material shall be accomplished as shown on the plans, specified in Particular Specifications and Special Provisions or as directed by the Engineer. Construction of embankment with A-3 material shall be carried out in a series of operations as follows:

Edge berms shall first be constructed along both sides of the staked embankment, except where the embankment is to be constructed against hillsides or existing embankment, using Class A-1, A-2 or A-2-4 soils from roadway excavation or borrow or any other source which can resist erosion by wind and water and are approved by the Engineer. However, if Engineer so approved A-4 material having PI value 4-8 from borrow excavation can be used for confinement. Edge berms shall be constructed with an external side slope as shown on the plans or specified in these Particular Specifications and Special Provisions, but not steeper than one (1) vertical to three (3) horizontal. Edge berms shall be constructed not more than thirty (30) centimeters in height w.r.t A-3 embankment and not less than 2.0 meters wide at the top. The materials shall be placed and spread in layers as specified in these Specifications and compacted as specified in Table 108.3.1.

### **108.3.8 Formation of Embankment on Existing Structures**

When an embankment surface is to be constructed over an area previously occupied by a building basement, cellar, irrigation canal, well, any previous excavation, or other such construction that will not permit the use of normal compaction equipment, the embankment



construction shall conform to the backfilling requirements specified in Structural Backfilling in these Specifications, until the normal compaction equipment can be used. The material shall be compacted to the density specified for the adjacent embankments.

**108.3.9 Trial Section**

Before starting the filling of the embankment, the Contractor shall construct trial sections of minimum 200 meters and maximum of 500 meters or as directed by the Engineer with each soil type / source proposed to be used as fill material. The soils used in the trials shall be the same as those intended to be used for the formation of embankment and the compacting equipment shall be the same that the Contractor will use for the main work.

The construction of embankment with any type of soil / material source shall be subject to written approval of the Engineer after the trial section made for that particular type of soil/material source.

The objective of these trials shall be to determine the optimum moisture content and the relationship between the number of passes of compacting equipment and density obtained for the soil types under trial and for the verification of the soil type itself. No separate payment will be made for this work, which shall be required as a subsidiary obligation of the Contractor under Pay Item Nos. 108a, 108b or 108c, as the case may be. The Engineer may order additional compaction test sections when deems necessary.

**108.4.1 Measurement**

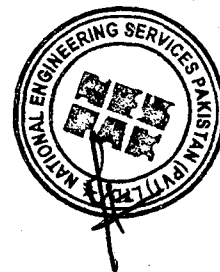
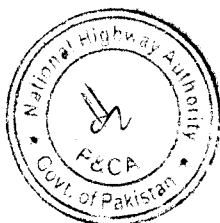
**iii) Formation from Roadway Excavation**

In para 1, last line, delete "&108b"

**108.4.2 Payment**

Replace the table as under:

Pay Item No.	Description	Units of Measurement
108a	Formation of Embankment from Roadway Excavation in Common Material	CM
108c	Formation of Embankment from Borrow Excavation in Common Material	CM
108d	Formation of Embankment from Structural Excavation	CM





## ITEM 109 SUBGRADE PREPARATIONS

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### 109.2.3 Subgrade Preparation in Earth Cut

Delete para one and two and replace with the following:

In case bottom of subgrade level is within thirty (30) cm of the natural ground, the top  $\leq$  fifteen (15) cm material shall be removed and stockpiled at a nearby location. The exposed surface shall then be scarified, broken up, adjusted to optimum moisture content and compacted to minimum density of ninety five (95) percent of the maximum dry density as determined by AASHTO T-180 Method D. Second layer of sub-grade shall then be prepared by incorporating the above mentioned stockpiled material to ensure that the depth of sub-grade layer is thirty (30) cm.

In case, the bottom of sub-grade is below the natural ground by more than thirty (30) cm, the material above the top of sub-grade shall be removed and subsequent layer of thirty (30) cm shall be prepared in two layers as per the method describe above.

At the end add the following:

Subgrade of thirty (30) cm. shall in any case be prepared and compacted in two layers of fifteen (15) cm. each.

### 109.2.8 Protection of Completed Work

Add at the end:

It will be at discretion of the Engineer to check some or all such reaches for compaction and moisture content before placing the next layer.

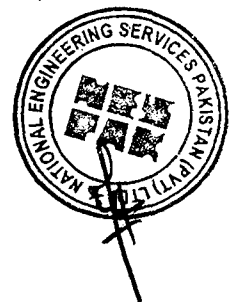
### 109.2.9 Templates and Straightedges

Delete and replace by following:

The Contractor shall provide for the use of the Engineer, satisfactory templates and straightedges in sufficient numbers to check the accuracy of the work, as provided in these specifications and no subsequent work shall be permitted until the sub-grade levels have been checked and approved by the Engineer.

### 109.2.10 Finishing Tolerances and Requirements

Quality Assurance measuring or testing shall involve verification that the sub-grade is constructed, timely finished and trimmed in a neat, workmanlike manner to the lines, grades and typical cross sections shown on the Plans or staked by the Engineer within the required tolerances.



## ITEM 201 GRANULAR SUBBASE

### 201.2 MATERIAL REQUIREMENTS

Delete para 1 and replace it with the following:

“Material for Subbase shall consists of hard durable crushed gravel, crushed rock and crushed stone fragments and shall be cleaned and free from dirt organic matter and other deleterious substances and shall be of such nature that it can be compacted readily under water and rolling to form a firm stable subbase.”

In para (a):

Delete first sub-para including the table and replace with the following:

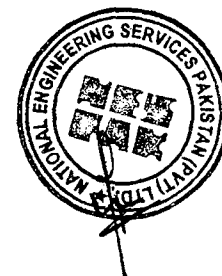
- a) The Sub-base material shall conform to gradation requirement as specified in ASTM D-2940 and given below:

Grading Requirements for Crushed Aggregate Sub-base Material		
Sieve Designation		Mass Percent Passing
mm	Inch	
50.0	2	100
37.5	1½	90-100
25.0	1	78-92
9.5	3/8	50-73
4.75	No. 4	30-60
2.00	No. 10	24-50
0.425	No. 40	13-32
0.075	No. 200	0-12

The final gradation decided within the limit designated in the table shall be all graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieves or vice versa.

Gradation requirements shall not apply on Broken Pavement Material (Asphalt layer/TST is not included) from existing road except passing at 0.075 mm sieve, being reused as Sub-base.

In para (e), line 4, delete “6” and insert “4”



### 201.3 CONSTRUCTION REQUIREMENTS

#### 201.3.5 Moisture Content Determination

Delete para (b).

Same size of sample should be placed in oven for moisture determination in case of laboratory density (Proctor) and field density to ensure compatible compaction results.

Add at the end:

#### 201.3.7 Protection of Completed Work

Any part of the sub-base that has been completed shall be protected and kept well drained. Any damage resulting from carelessness of the Contractor shall be repaired as directed by the Engineer without additional payment.

The Contractor shall be responsible for all the consequences of traffic being allowed to ply on the sub-base. He shall repair any ruts or ridges occasioned by his own traffic or that of others by reshaping and compacting with rollers of the size and type necessary for such repair. He shall limit the area of sub-base preparation to an area easily maintained with the equipment available. Sub-base preparation and placing of aggregate base course shall be arranged to follow each other closely. The sub-base, when prepared too soon in relation to the placing of the aggregate base course, is liable to deteriorate, and in such case the Contractor shall, without additional payment, repair, reroll, or re-compact the sub-base as may be necessary to restore it to the state specified herein.

It will be at discretion of the Engineer to check some or all such reaches for compaction, moisture content and surface irregularities before placing the next layer.

### 201.4 MEASUREMENT AND PAYMENT

#### 201.4.2 Payment

Replace the table of Pay Items by the following:

Pay Item No.	Description	Unit of Measurement
201a	Granular Sub-base (Crushed Aggregate)	CM
201b	Re-use of Broken / Salvaged Granular Material from existing road as Sub-base	CM



## ITEM 202 AGGREGATE BASE COURSE

### 2.2.2 MATERIAL REQUIREMENTS

Delete this Section completely and replace as follows:

Material for crushed aggregate base course shall consist of crushed hard durable gravel, rock or stone fragments. It shall be clean and free from organic matters, lumps of clay and other deleterious substances. The material shall be of such a nature that it can be compacted readily under watering and rolling to form a firm and stable base for both flexible and rigid pavements.

The aggregate base shall comply with the following grading and quality requirements.

- a) The gradation curve of the material shall be smooth, well graded and within the specified allowable tolerances and the envelope.

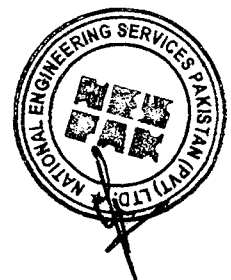
The grading table as per ASTM D 2940 given below:

Grading Requirements for Crushed Aggregate Base Material		
Sieve Designation		Mass Percent Passing Grading
mm	Inch	
50.0	(2)	100
37.5	(1.5)	95-100
19.0	(3/4)	70-92
9.5	(3/8)	50-70
4.75	No. 4	35-55
0.600	No. 30	12-25
0.075	No. 200	0-8

The final gradation decided within the limit designated in the table shall be all graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieves or vice versa.

This material shall be obtained by mechanically crushing the material retained on 3" size sieve.

The material shall be well graded so that the coefficient of Uniformity



D60/D10 shall be greater than four (4).

- b) The material passing the 19 mm sieve shall have a CBR value of minimum eighty (80) percent, tested according to the AASHTO T-193 / ASTM D-1883. The CBR value shall be obtained at the maximum dry density determined according to AASHTO T 180, Method D.
- c) The Coarse aggregate shall have a percentage of wear by the Loss Angeles Abrasion test (AASHTO T-96) of not more than forty percent (40%).
- d) The fraction passing the No. 200 sieve shall not be greater than two third of the fraction passing the 0.425 mm (No 40) sieve.
- e) The portion of filler, including any blended material, passing No. 40 mesh sieve shall have a liquid limit not more than 25 and a plasticity index not more than 6 as per AASHTO T 89 & T 90
- f) The sand equivalent determined according to AASHTO T-176 shall not be less than 45.
- g) Crushed Aggregate (material retained on sieve No. 4) shall consist of material of which hundred (100) percent by weight shall be crushed particles having a minimum one fractured face and at least ninety (90) percent by weight shall be crushed particles, having a minimum of two (2) fractured faces.
- h) The material shall have a loss of less than twelve (12) percent when subjected to five cycles of the Sodium Sulphate Soundness test according to AASHTO T-104.
- i) Flat, elongated, soft and disintegrated pieces shall not exceed 10 % of total volume of Crushed Aggregate Base Course.
- j) Friable particles tested according to AASHTO T-112 shall not exceed 0.25 %.

#### **202.2.1 Filler for Blending**

In the table change Plasticity Index value from "6 maximum" to "4 maximum" and Sand Equivalent value from "30 minimum" to "45 minimum"

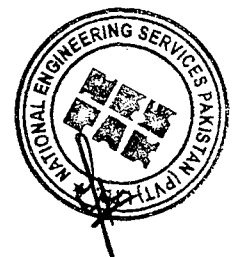
#### **202.3 CONSTRUCTION REQUIREMENTS**

Delete this Section completely and replace as follows:

##### **202.3.1 Mixing of Aggregate Material**

Mixing of different sizes of aggregate and stone dust shall be mixed in the central mixing plant/pug-mill at proper moisture content. Mixing at site or over prepared sub-base shall not be allowed in any case.

It shall be mandatory for the Contractor to lay aggregate base course in specified



thickness, line and grade on approved surface using mechanical paver. Dumping the aggregate base material on prepared sub-base and spreading with motor grader will not be allowed. The paver shall be power propelled unit, provided with automatically controlled screeds and feed controls capable of spreading the aggregates and maintaining specified thickness and grade. The paver shall be equipped with receiving hoppers having sufficient capacity for a uniform paving operation. The paver shall be operated at a constant speed to give best results. The mechanical paver has to be approved by the Engineer's Representative prior to start of paving activity.

**202.3.2 Preparation of Surface for Crushed Aggregate Base Course**

In case crushed aggregate base is to be laid over approved sub-base course, the sub-base course shall not have loose material or dried / over moist condition w.r.t optimum moisture content.

**202.3.3 Compaction Process**

Compaction process shall conform in all respect to the requirements specified under this heading in Item 201 (201.3.3).

**202.3.4 Compaction Requirement**

The relative compaction of each layer of the compacted base shall not be less than 100 percent of the maximum dry density determined according to AASHTO T-180, Method D after adjustment of coarse particles obtained during field density test (retained on 19 mm sieve or 4.75 mm sieve whichever is applicable) as per AASHTO Method T-224. The field density shall be determined according to AASHTO T-191.

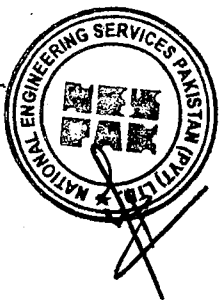
Completed base course shall be maintained in an acceptable condition at all times until prime coat is applied. When base course is to carry traffic for an indefinite length of time before receiving surfacing, the Contractor shall maintain the surface until final acceptance and shall prevent reveling by wetting, blading, rolling and addition of fines as may be required to keep the base tightly bound and leave a slight excess of material over the entire surface which must be removed and the surface finish restored before application of prime coat.

**202.3.5 Moisture Content Determination**

Moisture content determination shall conform in all respects to the requirements specified under clause 201.3.5 for sub-base.

**202.3.6 Trial Sections**

Prior to commencement of crushed aggregate base course operations, a trial section of two hundred (200) meters minimum, but not to exceed five hundred (500) meters shall be prepared by the Contractor using same material and equipment as will be used at site to determine the adequacy of equipment, loose depth measurement necessary to result in the specified compacted layer depths,



field moisture content, and relationship between the number of compaction passes and the resulting density of material.

### **202.3.7 Surface Tolerance**

Grade control shall be accomplished by means of grade stakes, steel pins or forms, placed in lanes parallel to the centerline of the road and at intervals sufficiently close to permit placing of string lines or straightedges for checking purposes.

The surface layer of the crushed aggregate base course shall be evaluated for compliance with the following surface tolerances:

- a) The cross section of the finished aggregate base surface shall be checked by the Contractor in the presence of the Engineer at maximum intervals of twenty-five (25) meters and at intermediate points as directed by the Engineer.
- b) The allowable tolerances in design elevation of the finished base are stated in "Table for Allowable Tolerances" in these Specifications.

Isolated deviations below the design elevation shall be compensated by additional thickness of the subsequent pavement layer. Additional cost and materials resulting from deviations from the design elevation shall be borne by the Contractor.

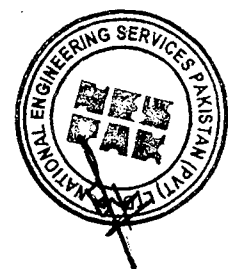
### **202.3.8 Acceptance, Sampling and Testing**

Acceptance of sampling and testing with respect to materials and construction requirements shall be governed by the relevant, "Table for Sampling and Testing Frequency" or as approved by the Engineer.

### **202.3.9 Protection of Completed Work**

Any part of the aggregate base course that has been completed shall be protected and kept well drained. Any damage resulting from carelessness of the Contractor shall be repaired as directed by the Engineer without additional payment.

The Contractor shall be responsible for all the consequences of traffic being allowed to ply on the aggregate base course. He shall repair any ruts or ridges occasioned by his own traffic or that of others by reshaping and compacting with rollers of the size and type necessary for such repair. He shall limit the area of aggregate base course preparation to an area easily maintained with the equipment available. Aggregate base course preparation and placing of asphalt base course shall be arranged to follow each other closely. The aggregate base course, when prepared too soon in relation to the placing of the asphalt base course, is liable to deteriorate, and in such case the Contractor shall, without additional payment, repair, re-roll, or re-compact the aggregate base course as may be necessary to restore it to the state specified herein.



It will be at discretion of the Engineer to check some or all such reaches for compaction, moisture content and surface irregularities before placing the next layer.

202.4.2 Payment

Replace the pay Item table as follows:

Pay Item No.	Description	Unit of Measurement
202	Aggregate Base Course (Mixing in Central mixing Plant/ Pugmill and Laid with Mechanical paver)	CM





## **ITEM 203 ASPHALTIC BASE COURSE (HOT PLANT MIX)**

Delete the entire item and replace it by the following:

### **203.1 DESCRIPTION**

This work shall consist of furnishing plant, labor, equipment, materials, mixing aggregates and asphalt binder and additive material (where required) at a central batch asphalt mixing plant, to a specified temperature, hauling, including loading unloading, laying and compacting the mixture on an approved primed sub-grade, sub-base or base course in accordance with these Specifications and in conformity with the lines grades and typical cross-sections shown in the Drawings or as directed by the Engineer.

### **203.2 MATERIAL REQUIREMENTS**

#### **203.2.1 Mineral Aggregate**

Mineral aggregate for bituminous base course shall consist of coarse aggregate, fine aggregate and filler material, if required, all conforming to the following requirements:

Coarse aggregate which is the material retained on AASHTO No. 4 sieve shall consist of crushed rock, crushed gravel or crushed boulder. It shall be clean, hard, tough, sound, durable, and free from decomposed stones, organic matter, shale, clay lump or other deleterious substances. Rock or boulders, from which coarse aggregate is obtained, shall be of uniform quality throughout the quarry.

The crushing shall be so regulated that (material retained on sieve # 4) shall have all faces crushed without any uncrushed surface. The type of source shall be uniform throughout the quarry location from where such a material is obtained. Rock to be crushed for use as bituminous concrete aggregate, shall be screened in such a manner that all material to be crushed is retained on a 75 mm (3") screen.

Fine aggregate which is material passing No. 4 sieve, shall consist of 100% crushed material from rock and shall be stored separately. No natural sand will be allowed in the mix.

When the combined grading of the coarse and fine aggregates is deficient in material passing No. 200 sieve, additional filler material shall be added. The filler material shall consist of finely divided rock dust, including dust from plant collection system, hydrated lime, hydrated cement or other suitable mineral matters free of deleterious material conforming to the requirements of AASHTO M-17. However, in case the coarse aggregates are of quartzitic nature, then hydrated lime or a better material shall be required. At the time of use, it shall be sufficiently dry to flow freely. Filler material shall conform to following gradation:

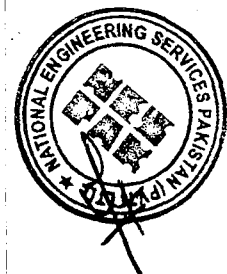


US Standard Sieve	Percent Passing by Weight
No. 30	100
No. 50	95 – 100
No. 200	70 – 100

The ratio of filler to binder should range from 1.0-1.5.

The coarse and fine aggregates shall meet the following requirements:

- a) The coarse aggregate shall have a percentage of wear by the Los Angeles Abrasion test (AASHTO T-96) not more than forty (40).
- b) The coarse and fine aggregates shall have a Specific Gravity value of not less than 2.60 and value for absorption of water not more than 2% as determined by AASHTO T 84 and T 85.
- c) The material shall have a loss of less than twelve (12) percent when subjected to five cycles of the Sodium Sulphate Soundness test according to (AASHTO T-104).
- d) The Sand Equivalent (AASHTO T 176) determined after all processing except for addition of asphalt cement shall not be less than forty five (45).
- e) The fine fraction of the material shall have a liquid limit not more than twenty five (25) and a Plasticity Index (as determined by AASHTO T-89 and T-90) not more than four (4). The plasticity index of mineral filler should not be more than four (4).
- f) The portion of aggregate retained on the 9.5 mm (3/8 inch) sieve shall not contain more than fifteen (15) percent by weight of flat and/or elongated particles as determined in accordance with ASTM D 4791, standard test method for flat and/or elongated pieces (ratio of maximum to minimum dimension = 3:1).
- g) The coarse aggregate when tested by the Coating and Stripping Test (AASHTO T-182) shall have a coated area above ninety five (95) percent.
- h) Petrographic examination of the coarse aggregate is mandatory for the approval of source. The coarse aggregates shall be checked for cationic and anionic behavior so that their affinity with the bitumen to be used is verified.



### 203.2.2 Asphalt Material

Asphalt binder for asphalt base course shall be asphalt cement 60-70 penetration grade, conforming to the requirement in Table 301-2 of Item Asphaltic Materials in these Specifications.

When asphalt cement 60-70 penetration grade is used, the optimum ratio between bituminous material and filler shall be so determined that the bituminous filler mixture will reach its softening point, not less than eighty (80) degree centigrade when tested in accordance with AASHTO T 53

### 203.2.3 Asphalt Base/Leveling Course Mixture

The composition of the asphalt base/leveling course mixtures for base course shall conform to classes shown in the following table:

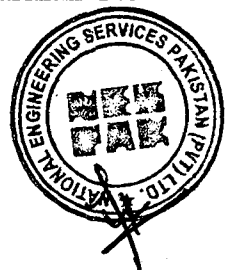
**Table 203-1**

**Combined Aggregate Grading Requirements**

Mix Designation	Class-A	Class-B
Use	Leveling/Base	Leveling/Base
Compacted Thickness	75-100 mm	75-100 mm
<i>U.S. Standard Sieve Size</i>	<i>Percent passing by weight</i>	
1½" (38 mm)	100	100
1" (25 mm)	75-90	90-100
¾" (19 mm)	65-80	-
½" (12.5 mm)	55-70	56-80
⅜" (9.5 mm)	45-60	-
No. 4 (4.75 mm)	30-45	29-59
No. 8 (2.38 mm)	15-35	19-45
No. 50 (0.300 mm)	5-15	5-17
No. 200 (0.075 mm)	2-7	1-7
Asphalt Content by weight of mix (%)	3 (Minimum)	

Class-B shall be used for Asphaltic Base / Levelling course unless specified otherwise by the Engineer. The grading limits specified are based on materials of uniform specific gravity and shall be adjusted by the Engineer to compensate any variation in specific gravity of individual sizes. The grading may be varied by the Engineer on the basis of Marshall Tests to obtained optimum stability and life of completed asphalt pavement. Grading limits determined by Fuller Equation (MS - 2) should be avoided.

The asphalt leveling/base course mixture shall meet the following Marshall Test Criteria:



Compaction, number of blows to each end of specimen

Stability (30 minutes/60 °C)	75 1,000 kg (Min.)
Flow, 0.25 mm (0.01 in.)	8-14 (2 - 3.5)
Percent air voids in mix	4-6
Percent voids in mineral aggregates	According to table 5.3 MS-2, Asphalt Institute sixth edition or the latest edition
Percent voids filled with asphalt	50-65
Loss of Marshall Stability	25 percent (max.)

#### 203.2.4 Job-Mix Formula

At least eight (8) weeks prior to commencement of asphalt, the Contractor shall start the tests for the design of JMF for the asphalt base course production for the Project. At least one week prior to production, a JMF for the asphalt mix to be used shall be established jointly by the Contractor and the Engineer meeting Project Specification requirements.

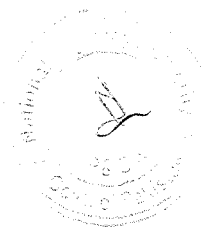
The JMF shall be established by Modified Marshall Method of Mix Design for Large Aggregate according to the procedure prescribed in the Asphalt Institute Manual Series No. 2 (MS-2), Sixth Edition, taking into account following recommendations.

The JMF, with the allowable tolerances shall be within the range specified in Item 203.2.3 and herein. Each JMF shall indicate a single percentage of aggregate passing each required sieve size and a single percentage of bitumen to be added to the aggregate.

Marshall mixing temperature shall be one hundred and sixty plus/minus five ( $160 \pm 5$ ) degree centigrade at which heated asphalt produces a kinematic viscosity one hundred and seventy  $\pm$  twenty ( $170 \pm 20$ ) centistokes.

Marshall compacting temperature shall be one hundred and forty five plus/minus five ( $145 \pm 5$ ) degree centigrade at which heated asphalt produces a kinematic viscosity of two hundred and eighty plus/minus thirty ( $280 \pm 30$ ) centistokes.

The combined gradation should produce a smooth curve within the master grading band for designated mix. The job-mix formula with allowable tolerances for a single test then becomes the job control grading band. If application of job-mix



tolerances results in a job control grading band outside the master grading band, the full tolerances shall still apply. The asphalt content thus determined shall be used to check for compliance for stability, flow and voids filled, etc. as per the specifications. Minimum coating of bitumen film on aggregate should be 8 micron.

### METHODOLOGY FOR MODIFIED MARSHAL METHOD

Mixes composed of larger size aggregates with maximum size up to 38 mm (1.5 inches) will be prepared according to modified Marshall Method as per MS-2 Asphalt institute, sixth edition, 1993 or the latest edition. The procedure is basically the same as the original method except for following differences that are due to the larger specimen size that is used:

- a) The hammer weighs 10.2 kg (22.5 lb.) and has a 149.4 mm (5.88 inches) flat tamping face. Only mechanically-operated device is used for the same 457 mm (18 inches) drop height.
- b) The specimen has a 152.4 mm (6 inches) diameter by, 95.2 mm (3.75 inches) height.
- c) The batch weights are typically of 4 Kg.
- d) The equipment for compacting and testing (molds and breaking heads) are proportionately larger to accommodate the larger specimens.
- e) The mix is placed in the mold in two approximately equal increments, with spading performed after each increment to avoid honey-combing.
- f) The number of blows needed for the larger specimen is 1.5 times (75 or 112 blows) of that required for the smaller specimen (50 or 75 blows) to obtain equivalent compaction.
- g) The design criteria shall be modified as well, the minimum stability shall be 2.25 times and the range of flow values shall be 1.5 times normal-sized specimens.
- h) Similar to the normal procedure, following values shall be used to convert the measured stability values to an equivalent value for a specimen with a 95.2 mm (3.75 inches) thickness, if the actual thickness varies:

Approximate Height mm (inches)	Specimen Volume (Cubic cm)	Correlation Ratio
88.9 (3 1/2)	1608 to 1626	1.12
90.5 (3 9/16)	1637 to 1665	1.09
92.1 (3 5/8)	1666 to 1694	1.06
93.7 (3 11/16)	1695 to 1723	1.03
95.2 (3 3/4)	1724 to 1752	1.00
96.8 (3 13/16)	1753 to 1781	0.97
98.4 (3 7/8)	1782 to 1810	0.95
100.0 (3 15/16)	1811 to 1839	0.92
101.6 (4)	1840 to 1968.	0.90



Prior to final approval, the proposed job mix, with a Asphalt content at the permissible upper percentage limit determined in JMF, shall be compacted to refusal density (when density does not increase with additional compaction efforts or breakage of stones start) such that the resulting air voids in the mix shall not be less than 3%.

Once JMF is established, all mixtures furnished for the project represented by samples taken from the asphalt plant during operation, shall conform thereto. Moreover upon receiving the job-mix, approved by the Engineer, the Contractor shall adjust his plant to proportion the individual aggregates, mineral filler and asphalt to produce a final mix that when compared to job mix formula shall be within the following limits.

**Maximum Variation of Percentage of Materials**

Retained No. 4 and larger	± 7.0 %
Passing No. 4 to No. 100 sieve	± 4.0 %
Passing No. 200	± 1.0 %
Asphalt Content (weight % of total mixture)	-0.2% to +0.2 %

In addition to meeting the requirements specified in the preceding items, the mixture as established by the JMF shall also satisfy the following physical properties:

- a) Loss of Marshall Stability by immersion of specimen in water at sixty (60) degree centigrade for 24 hours as compared with stability measured after immersion in water at sixty (60) degrees centigrade for twenty (20) minutes shall not exceeds twenty five (25) percent. If the mixture fails to meet this criterion, the JMF shall be modified.
- b) In case mix fails to meet the stripping test requirement then anti-stripping agent shall be used for which no separate payment shall be made.
- c) Should a change of source of materials be made, a new JMF shall be established before the new material is used. When unsatisfactory results or other conditions make it necessary, a new Job Mix Formula will be required.
- d) The assistance of the Engineer in the preparation of the job standard mix in no way relieves the Contractor of the responsibility of producing an Asphalt mix meeting the requirements of the Specifications.
- e) The density of the compacted mixes shall be related to the daily Marshall Density which shall be determined by making three standard Marshall Specimens from samples of the mix taken from behind the paver. The density of each sample shall be determined and compared with the mean value. Any individual result which varies from the mean by more than 0.015 gm/cc shall be rejected. Marshall Test shall be repeated on a daily basis to establish the



- f) Daily Marshall Density for that particular day's work or one sample of 500T production. The daily Marshall Density shall not vary from the Job Mix Design Density by more than  $\pm 1.0\%$ . Loss of stability shall be tested on other three Marshall Specimens from samples of the mix taken from behind the paver.
- g) The compliance criteria contained in the Job Mix Tolerances provide an indication of the maximum acceptable value of the standard deviation for each parameter. If asphalt mix shows variation in excess of these limits, the source of variation shall be determined by the Contractor and rectified by him to the satisfaction of Project Specifications and Engineer. If the excessive variations continue, the Engineer shall order stoppage of production and laying for the Works, until the Contractor has demonstrated his ability to re-establish acceptable control.

### 203.2.5 Asphalt Additives

Hydrated lime or any other additive may be used as an anti-stripping agent as and when required. When used, hydrated lime shall be added at a rate between 1% and 2% by weight of the total mix with the aim of eliminating stripping tendencies. Hydrated lime shall be fed by a separated feeding system into pug mill for each batch. Percentage of additive and relative specifications for any other type of additives shall be based on manufacturer's specifications for the product, subject to approval of the Engineer.

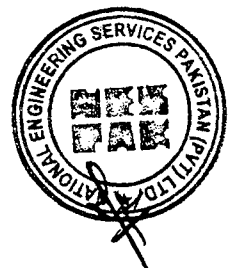
No additional cost shall be paid for use of hydrated lime or any other anti-stripping additive, and payment shall be deemed to be included in the respective pay items of asphaltic base course.

## 203.3 CONSTRUCTION REQUIREMENTS

### 203.3.1 Asphalt Mixing Plant

Mixing plants used for the preparation of Asphalt Mixtures shall be batch plants conforming to AASHTO M-156, and of adequate capacity, coordinated and operated to produce a mixture within the limits of specifications. Plant shall have minimum three cold bins and at least 3<sup>1/2</sup> decks of hot sieves to effectively control the gradation of hot bins. It should be provided with facilities necessary for protection of environment such as dust control facility. Special emphasis shall be given to the following considerations:

- A large bucket to handle a batch in a single weighing.
- The mixer box shall be equipped with a dust hood to prevent loss of dust by dispersion.
- A mechanical batch counter shall be installed as part of the timing device and shall be designated to register only completely mixed batches.



- The plant shall be fully computerized batch-plant.
- The automatic proportioning system shall be capable of consistently delivering materials within the full range of batch sizes within the following tolerances:

Description	Total Batch Weight of Paving Mix %
Batch aggregate component	±1.5
Mineral filler	±0.5
Bituminous material	±0.1
Zero return (aggregate)	±0.5
Zero return (bituminous material)	±0.1

An automatic graphic or digital record shall be produced for each batch of bituminous concrete indicating the proportions of each aggregate component, mineral filler, and bituminous material. Such records of the batches shall be further identified through a print of day and date. Bituminous material proportions shall be recorded either as weight or volume.

### 203.3.2 Preparation of Aggregates

Before being fed to the dryer, aggregates for the asphalt base courses shall be separated into three or more sizes and stored separately in cold bins. One bin shall contain aggregate of such size that eighty (80) percent will pass sieve No. 4, and the other two bins shall contain aggregate of such sizes that eighty (80) percent will be retained on sieve No. 4. Should fine material, be incorporated in the mix, a separate bin shall be provided in addition to the three bins mentioned above. If filler is used as a separate component it will also be stored and measured separately and accurately before being fed into the mixer through filler screw mechanism.

Each aggregate ingredient shall be heated and dried at a temperature not to exceed one hundred and seventy (170) degree centigrade. If aggregates contain sufficient moisture to cause foaming in the mixture or their temperature is in excess of one hundred and seventy (170) degree centigrade they shall be removed from the bins and returned to their respective stock piles. Immediately after heating, the aggregates shall be screened to required sizes and stored in separate bins for batching and mixing with Asphalt material

In placing the materials in bins or in moving those from bins to the mixer, any method which causes segregation or uncontrolled combination of material of different grading shall be discontinued.

Asphalt cement shall be heated within a temperature range of hundred and thirty





five to hundred and sixty three (135-163) degrees centigrade at the time of mixing. Asphalt cement heated above maximum shown shall be considered overheated and shall be rejected and removed from job site.

Dried aggregate weighed and drawn to pug-mill shall be combined with proportionate quantity of asphalt cement according to the job mix formula. Temperature of asphalt, except for temporary fluctuations, shall not be lower than fifteen (15) degree centigrade below the temperature of the aggregate, at the time; the two materials enter into the pug-mill. In no case shall the temperature of an asphalt mix exceed one hundred and sixty five (165) degree centigrade when discharged from the pug-mill.

### 203.3.3 Hauling Equipment

Dump truck used for hauling bituminous mixtures shall have tight, clean, smooth metal beds which have been thinly coated with an approved material to prevent adhering of material to the beds. Each truck shall have a cover of canvas or of other suitable material of sufficient size as to protect the mixture from the weather. The mixture will be delivered on the road at a temperature not less than hundred and forty five plus/minus five ( $145 \pm 5$ ) degree C. Drivers of dump trucks will ensure that while reversing the vehicles, paver is not pushed back producing a hump.

### 203.3.4 Bituminous Pavers

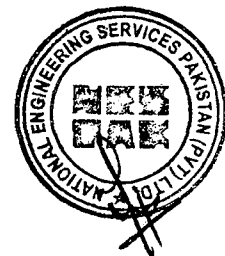
Bituminous pavers shall be self-contained, power-propelled units, provided with an automatically controlled activated screed or strike-off assembly, heated if necessary, capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and thickness shown on the plans. Pavers used for shoulders and similar construction shall be capable of spreading and finishing course of bituminous plant mix material in widths shown on the plans.

The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The paver shall be equipped with automatic feed controls, properly adjusted to maintain a uniform depth of material ahead of the screed.

The screed or strike-off assembly shall be capable of producing a finished surface of the required evenness and texture without tearing, shoving or gouging the mixture.

When laying the mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture. The paver shall be operated at speeds which will give the best result for the type of power being used.

The mixed material shall be delivered to paver in time to permit completion of spreading, finishing and compaction of mixture during day light hours.



The paver shall be equipped with automatic screed controls with sensors for either or both sides of the paver, capable of sensing grade from an outside reference line, sensing the transverse slope of the screed and providing the automatic signals which operate the screed to maintain the desired grade and transverse slope. The sensor shall be so constructed that it will operate from a reference line or a ski-like arrangement.

The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent variation.

Manual operation will only be permitted in the construction of irregularly shaped and minor areas.

Whenever a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods in order to allow the contractor to use the asphalt already produced at the plant or in transit, provided this method of operation will produce results otherwise meeting the specifications.

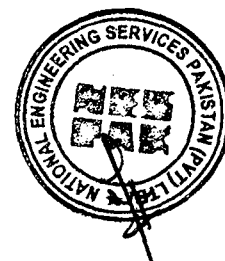
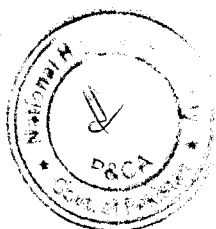
Reference lines will be required for both outer edges of the traveled way for each main line roadway for vertical control. Horizontal control utilizing the reference line will be permitted. The grade and slope for intermediate lanes shall be controlled automatically from reference lines or by means of a ski and a slope control device or a dual ski arrangement. When the finish of the grade prepared for paving is superior to the established tolerance and, when in the opinion of the Engineer, further improvement to the line, grade, cross sections and smoothness can best be achieved without the use of the reference line; a ski-like arrangement may be substituted subject to the approval of the Engineer. The use of the reference lines shall be reinstated immediately whenever the Contractor fails to maintain a superior pavement. The Contractor shall furnish and install all pins, brackets, tensioning devices, wire and accessories necessary for satisfactory operation of the automatic control equipment.

### 203.3.5 Rollers

Rollers shall be steel wheel, pneumatic tyre and vibratory, or a combination thereof. The roller(s) shall be in good condition, capable of reversing without backlash, and shall be operated at speeds slow enough to avoid displacement of the bituminous mixture. The number and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. Vibratory rollers shall be acceptable for bituminous mixture compaction. The use of equipment, which results in excessive crushing of the aggregate, will not be permitted.

### 203.3.6 Preparation of Base or Existing Pavement Surface

Before spreading materials, the surface of base or existing pavement on which the mix is to be placed shall be conditioned by application of a prime or tack coat as specified.



After a prime coat is applied, it shall be left undisturbed not less than forty eight (48) hours. The Contractor shall maintain the primed surface until the mix material has been placed. This maintenance shall include the spreading of sand or other approved material, if necessary to prevent adherence of the prime coat to the tyres of vehicles using the primed surface, and patching any breaks in the primed surface with additional bituminous material. Any area of primed surface that has become damaged shall be repaired before the mix is placed, to the satisfaction of Engineer. It shall be ensured that primed surface is not in tacky condition, when premix is laid.

After a tack coat is applied, it shall be allowed to dry until it is in the proper condition of tackiness to receive the mix. The tack coat shall be applied only as far in advance of the placing of mix, as is necessary to obtain the proper condition of tackiness. Any breaks in the tack coat shall be repaired.

When the surface of the existing pavement or old base is irregular, it shall be brought to uniform grade and cross-section by leveling course as directed. The leveling course mixture shall conform to the requirements of Item 203.2.

A thin coating of bituminous material shall be sprayed on contact surface of curbing, gutters, manholes, and other structures, prior to the bituminous mixture being placed against them.

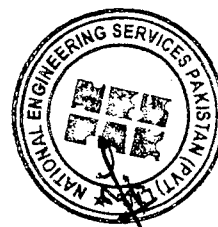
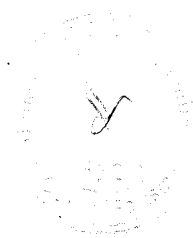
#### **203.3.7 Spreading and Finishing**

The mixture shall be laid upon an approved surface, spread and struck off to the section and elevation established. Bituminous pavers shall be used to distribute the mixture either over the entire width or over such partial width as may be practicable.

Longitudinal joints for each course shall be offset thirty (30) centimeters from the joint in the immediate underlying course. Transverse joints shall be offset a minimum of sixty (60) centimeters from the joint of the immediate underlying course.

Longitudinal joints shall be located within fifteen (15) centimeters of the centerline of the roadway or within fifteen (15) centimeters of the centerline of a lane. Longitudinal joints shall be held to the minimum practical number. Longitudinal joints shall be formed by lapping the screed over the first layer placed, crowding a ridge of Asphalt material at the joint and crimping the ridge of material into the joint by a compaction roller while the material is hot.

Transverse joints shall be formed by cutting back the first layer placed to the full depth of the layer, removing and wasting the material, spreading new Asphalt material in sufficient quantity to create a compacted thickness equal to the thickness of the first layer. The joint shall be cross rolled with one coverage and the joint checked with a straight edge not less than four (4) meters in length. High points shall be removed and sags filled with additional Asphalt material and the joint rolled a second time. The joint shall again be checked with a straight edge,



humps and sags adjusted as necessary, and rolled until the joint is complete and compacted as specified.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture shall be spread, raked and luted by hand-tools. For such areas the mixture shall be dumped, spread and screeded to give the required compacted thickness, ensuring even distribution of coarse and fine material.

When production of the mixture can be maintained and wherever practical, pavers shall be used in echelon to place the wearing course in adjacent lanes and compacted to form a surface without lateral joint.

All mixtures shall be spread at a temperature of not less than hundred and forty five plus/minus five ( $145 \pm 5$ ) degree C and all initial rolling or tamping shall be performed when the temperature of the mixture is such that the sum of the air temperature plus the temperature of the mixture is between 165 degree C and 190 degree C. The mixture shall not be placed on any wet surface or when weather conditions will otherwise prevent its proper handling or finishing.

Asphalt concrete pavement asphalt base course shall not be placed on any wet or frozen surface, during rain, dust or sand storms, when wind or other weather conditions prevent the proper handling of the Asphalt mixtures or when atmospheric temperature is five (5) degree centigrade or less. Care should be taken during spreading operation under windy condition in winter, even if temperature is above five (5) degree centigrade.

The spreading operations should be immediately terminated if it begins to rain during the operation.

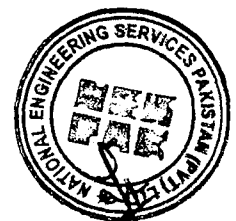
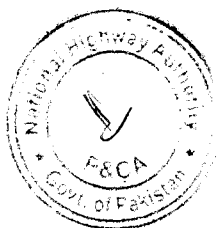
Hand laying of any Asphalt material will be permitted only in the following circumstances:

- a) For laying regulating courses of irregular shape and varying thickness;
- b) In confined spaces where it is impracticable for a paver to operate;
- c) For footways;
- d) At the approaches to expansion joints at bridges or viaducts;

#### 203.3.8 Compaction

After spreading and strike off and as soon as the mix condition permits the rolling to be performed without excessive shoving or tearing, the mixture shall be thoroughly and uniformly compacted. Rolling shall not be prolonged when cracks appear on the surface.

Initial or breakdown rolling shall be done by means of either a tandem steel roller



or three wheeled steel roller. Rolling shall begin as soon as the mixture will bear the roller without undue displacement.

The number and weight of rollers shall be sufficient to obtain the required compaction while the mixture is still in workable condition. The sequence of rolling and the selection of roller types shall provide the specified pavement density. Initial rolling with a tandem steel roller or a three-wheeled steel roller shall follow the paver as closely as possible.

Unless otherwise directed, rolling shall begin at the lower side and proceed longitudinally, parallel to the road centerline, each trip overlapping one-half of the roller width, gradually progressing to the crown of the road. When paving in echelon or abutting a previously placed lane, the longitudinal joint should be rolled first followed by the regular rolling procedure. On super elevated curves the rolling shall begin at the low side and progress to the high side by overlapping of longitudinal trips parallel to the centerline. Intermediate rolling with a pneumatic tyred roller shall be done behind the initial rolling. Final rolling shall eliminate marks from previous rolling. In no case shall the temperature be less than hundred and twenty (120) degree C. for initial break down rolling while all other compaction operations shall be completed before the temperature drops down to hundred and ten (110) degree C.

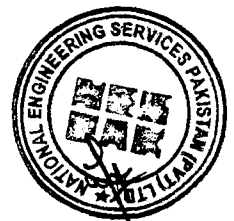
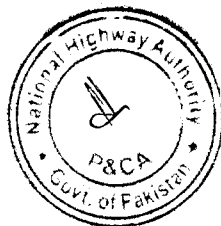
Rollers shall move at a slow but uniform speed with the drive roll or wheels nearest the paver. Rolling shall be continued until all roller marks are eliminated and a minimum density of Ninety seven (97) percent of a laboratory compacted specimen made from asphalt material obtained for daily Marshall Density is achieved.

Relevant test methods for density of bituminous concrete in place by Nuclear Methods such as ASTM D 2950 (latest version) and or other method as directed by the Engineer shall be used to establish the proper rolling effort and pattern to achieve the required density and to ensure achieving the specified percent compaction during the placement of the bituminous concrete as quality control testing. A calibration factor for the Nuclear Method must be established as per the equipment's manufacture's requirements, and at any time a change is made in the paving mixture, in construction process or after every fifteen days of asphalt production whichever is earlier. Compare the results obtained to samples compacted to Marshall Density to determine percentage of compaction.

Any displacement resulting while reversing the direction of a roller, or from other causes, shall be corrected at once by the use of rakes and addition of fresh mixture when required. Care shall be exercised in rolling not to displace the line and grade of the edges of the bituminous mixture.

To prevent adhesion of the mixture to the rollers, wheels of rollers shall be kept properly moistened with water or water mixed with very small quantities of detergent or other approved material. Excess liquid will not be permitted.

Along forms, curbs, headers, walls and other places not accessible to the roller,



the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons or with mechanical tampers. On depressed areas, tampers be used or cleated compression strips may be used under the roller to transmit compression to the depressed area.

Any mixture that becomes loose and broken, mixed with dirt, or is in any way defective in finish or density shall be removed and replaced with fresh hot mixture, which shall be compacted to conform to the surrounding area. Any area showing an excess or deficiency of bituminous material shall be removed and replaced.

Three steps of rolling are as follows:

**a) Breakdown Rolling**

Breakdown Rolling may be accomplished with static or vibratory steel-wheeled rollers. Compaction shall be carried out using rollers of approved dead weight smooth wheeled rollers or by multi-wheeled pneumatic tyred rollers of equivalent mass, or by vibratory rollers or a combination of these. Asphalt base/leveling course material shall always be surface finished with a smooth wheeled roller which may be a dead weight roller or alternatively a vibratory roller in non-vibrating mode. Vibratory rollers shall not be used in vibrating mode on bridge decks.

Vibratory rollers may only be used if they are capable of achieving at least the standard of compaction of 9-tonne dead weight roller to meet the specified percent compaction of Marshall Max. Density, and shall be equipped or provided with devices indicating the frequency at which the mechanism is operating and the speed of travel which can be read from the ground.

It is important to start the rolling operation on the low side of the mat (usually the outside of the lane being paved) and progress towards the high side. When adjoining lanes are placed, the same rolling procedure should be followed but only after compaction of the longitudinal joint.

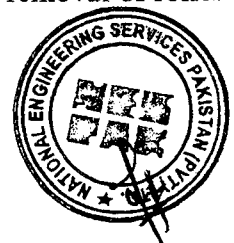
**b) Intermediate Rolling**

Intermediate rolling with pneumatic tyre rollers and should follow breakdown rolling as closely as possible, while the asphalt mix is still well above the minimum temperature at which densification can be achieved.

Intermediate rolling should be continuous until all of the mix placed has been thoroughly compacted. Regardless of the type of rollers used, the rolling pattern should be developed in the same manner as for breakdown rolling.

**c) Finish Rolling**

Finish rolling is done solely for the improvement of the surface. It should be accomplished with steel-tired, static-weight tandems or vibratory tandems without vibration while the material is still warm enough for removal of roller



marks.

The material shall be rolled in a longitudinal direction with the driven rolls nearest the paver. The roller should first compact the material adjacent to any joints and then work from the lower to the upper side of the layer overlapping on successive passes by at least half the width of the rear roll or in the case of a pneumatic tyre roller, at least the nominal width of one tyre.

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

### **203.3.9 Frequency of Testing for Cores**

One core shall be taken for each 100 linear meter of each lane of Asphalt Base, or fraction thereof, in special cases. If the core so taken fails to achieve the specified compaction (97%), then two (2) additional cores shall be taken in the longitudinal alignment of the road at an interval of three (3) meters on either side with respect to the failing core. If all the three cores give an average of 97% compaction, and the individual compaction of any core is not less than ninety five (95) percent, then the compaction shall be acceptable. If average of the three cores further fails against compaction, then two (2) additional cores shall be taken at a distance of fifteen (15) meters on either side and compaction shall be checked for all the five cores in the same fashion. If average of five cores is 97%, the area will be accepted. In case average of 5 (five) cores is ninety six percent (96%) or more, then Engineer may withhold the payment partly and observe behavior during maintenance period, for the release of full payment or otherwise. In case of failure of the average of these five cores giving average compaction of less than 96%, the failed area shall be removed and subsequently be replaced by specified mix in an approved manner at the expense of Contractor.

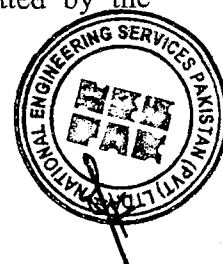
### **203.3.10 Surface Tolerances**

Surface smoothness of asphalt base/leveling course shall be measured with four (4) M straightedge by Engineer at selected locations. The variation of surface from testing edge of straightedge between any two (2) contacts shall be determined by placing it parallel and perpendicular to center line of roadway and value thus determined should not vary more than limits prescribed by "Table for Allowable Tolerances" in these Specifications.

Any irregularities that exceed the specified tolerances or that retain water on the surface shall be corrected by removing the defective area and replacing with new asphalt base course without additional cost to the Employer.

### **203.3.11 Base Thickness Tolerances**

For determination of thickness, one (1) core for each hundred (100) linear meter of each lane shall be taken. Unless otherwise permitted, cores extracted for thickness measurement shall not be used for density determination and density cores shall not be used for thickness measurements unless permitted by the



Engineer.

When layer thickness of asphaltic base course is deficient by more than five (5) mm from that specified in the Drawings, the deficiency shall be removed with satisfactory base course material and/or made up by additional asphalt concrete wearing course thickness without extra cost to the Employer. If such remedial action is authorized, revised thickness determinations shall be made by measurements of new cores taken after placing of "Asphaltic Wearing Course" material or as directed by the Engineer. If base course deficiencies are corrected in this manner, full payment for the "Asphaltic Base Course" will be made to the Contractor, but no additional payment will be made for the increase in thickness of the "Asphaltic Wearing Course".

### **203.3.12 Acceptance Sampling and Testing**

Acceptance of samples and testing of materials and construction requirements, shall be governed by the relevant, "Table for Sampling and Testing Frequency" or as approved by the Engineer.

### **203.3.13 Trial Section**

At least 3 days before material from each source of the asphalt concrete is first laid in the Works, the Contractor shall lay a trial area to demonstrate the compaction plant and rolling procedure selected by him for achieving the specified density.

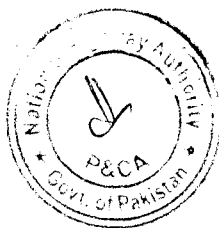
- a) The trial area shall be not less than 200 m in length and of a width to be approved by the Engineer. If the trial area complies with the Specifications, it may form part of the permanent Works;
- b) For the trial the Contractor shall use the materials, mixing and laying plant proposed for the main works;
- c) Where the required level of compaction is not achieved the trial area shall be removed and the trial repeated.

The Engineer shall approve test results and general performance of test area before actual commencement of the work.

## **203.4 MEASUREMENT AND PAYMENT**

### **203.4.1 Measurement**

The quantities for asphaltic leveling / base course will be measured by volume in cubic meters compacted in place. Measurement shall be based on the dimension as shown on plan or as otherwise directed or authorized by the Engineer. No measurement shall be made for unauthorized areas or for extra thickness.





The quantity of asphaltic material used is included in the asphalt mixture and will not be measured separately.

Quantities of liquid asphalt, wasted or remaining on hand after completion of the work, shall not be measured or paid for.

**203.4.2 Payment**

The quantity determined as provided above shall be paid by volume in cubic meter compacted in place for at the contract unit price for the particular pay item listed below and shown in the Bill of Quantities, which payment shall constitute full compensation for furnishing all labour, materials, tools, plant, equipment, mixing, transporting, laying, shaping, compacting, corrections, maintenance and all the incidentals necessary for the proper completion of the work prescribed in this item. Asphalt additives or anti-stripping agent if allowed and used to meet with JMF requirement shall not be paid directly, payment shall be to be included in the respective pay items of Asphalt Base Course (Hot Plant Mix).

Pay Item No.	Description	Unit of Measurement
203a	Asphaltic Base / Levelling Course – Plant Mix, Class A	CM
203b	Asphaltic Base / Levelling Course - Plant Mix, Class B	CM



Delete this Item and replace with the following:

**305.1 DESCRIPTION**

This work shall consist of furnishing and mixing aggregates, asphalt binder and additive material (where required) at a central asphalt mixing plant, to a specified temperature, hauling, including loading unloading, laying and compacting the mixture on an approved primed or tacked base, bridge deck or concrete pavement in accordance with these Specifications and in conformity with the lines grades and typical cross-sections shown in the Drawings or as directed by the Engineer.

**305.2 MATERIAL REQUIREMENTS**

**305.2.1 Asphalt Material**

Asphalt Binder for Wearing Course shall be 60/70 penetration grade conforming to requirement in Table 301-2 section Asphaltic Materials in these Specifications.

When penetration grade asphalt 60/70 is used, the optimum ratio between bituminous material and filler shall be so determined that the bituminous filler mixture will reach its softening point, not less than eighty (80) degree centigrade when tested in accordance with AASHTO T 53.

**305.2.2 Mineral Aggregates**

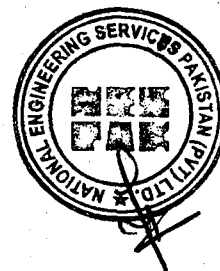
Mineral aggregates shall consist of coarse aggregate, fine aggregate and crushed rock filler material.

The coarse and fine aggregates shall be clean, hard, durable and sound particles of uniform quality, free from decomposed material, organic material, clay lumps or other deleterious substances.

The coarse aggregate which is the material retained on sieve No. 4 (4.75mm) shall consist of crushed rock 100 % particles having all faces fractured mechanically. The working face of the quarries from which mineral aggregates are being extracted shall be acceptably uniform and be free from layers, veins or intrusions of weathered rock, soil or other unsuitable minerals.

Rock to be crushed for use as bituminous concrete aggregate, shall be screened in such a manner that all material to be crushed is retained on a 75 mm (3") screen.

Fine aggregate which is material passing an AASHTO No. 4 sieve (Khaka / Stone dust), shall consist of 100% crushed limestone from rock having all faces fractured. Fine aggregate shall be stored separately. Natural sand shall not be used in the mix.



When the combined grading of the coarse and fine aggregates is deficient in material passing the AASHTO No. 200 sieve, supplemental fine aggregate shall be mineral filler consist of finely divided rock dust including dust from the plant dust collection system or cement free of deleterious material conforming to the following grading:

Standard Sieve Size AASHTO	Percentage Passing by Weight
No. 30	100
No. 50	95-100
No. 200	70-100

Mineral filler, at the time of use, shall be dry, free flowing, without lumps or agglomerations and conform to the requirements of AASHTO M-17.

The ratio of filler to binder should range from 1.0-1.5

The coarse and fine aggregates shall meet the following requirements:

- a) The coarse aggregate shall have a percentage loss by the Los Angeles Abrasion test (AASHTO T-96) of not more than thirty (30) percent.
- b) The coarse aggregates and fine aggregate shall have a Specific Gravity Value of not less than 2.65 & 2.60 respectively and value for absorption of water not more than 2% as determined by AASHTO T 84 and T 85.
- c) The material shall have a loss of less than ten (10) percent when subjected to five cycles of the Sodium Sulphate Soundness test according to AASHTO T-104.
- d) The Sand Equivalent (AASHTO T-176) determined after all processing except for addition of asphalt cement shall not be less than forty five (45).
- e) The fine fraction of the material shall have a liquid limit not more than twenty five (25) and a plasticity index (as determined by AASHTO T-89 and T-90) not greater than four (4). The plasticity index of mineral filler (if added separately) should not be more than four (4).
- f) The portion of aggregate retained on the 9.5 mm (3/8 inch) sieve shall not contain more than ten percent (10 %) flat and/or elongated particles (ratio of maximum to minimum dimensions = 3:1) or as determined in accordance with ASTM D 4791, standard test method for flat and/or elongated pieces.
- g) The coarse aggregate when tested by the Coating and Stripping Test (AASHTO T-182) shall have a coated area above 95 percent. In addition to this test, a test for coating and stripping shall be run after submerging the coated material in water at 60° C for 96 hours. The aggregate in this test shall have a coated area of above 80 percent.



- g) Petrographic examination of the coarse aggregate is mandatory for the approval of source. The coarse aggregates shall be checked for cationic and anionic behavior so that their affinity with the bitumen is verified.

### 305.2.3 Asphalt Concrete Wearing Course Mixture

The grading of combined aggregates prior to addition of bituminous material shall conform to gradation requirements within the following range:

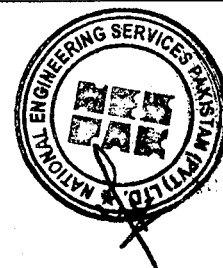
Combined Aggregate Grading Requirements as per ASTM D 3515

Standard AASHTO Sieve Sizes	Percentage Passing by Weight	
	Class A	Class B
1" (25.0 mm)	100	-
3/4" (19.0 mm)	90 - 100	100
1/2" (12.5 mm)	-	90 - 100
3/8" (9.5 mm)	56 - 80	-
No. 4 (4.75 mm)	35 - 65	44 - 74
No. 8 (2.36 mm)	23 - 49	28 - 56
No. 50 (0.3 mm)	5 - 19	5 - 21
No. 200 (0.075 mm)	2 - 8	2 - 10

The minimum binder content shall be 3.5 percent by mass of total weight of mix. The grading limits specified are based on materials of uniform specific gravity and shall be adjusted by the Engineer to compensate any variation in specific gravity of individual sizes. The grading may be varied by the Engineer on the basis of Marshall Tests to obtained optimum stability and life of completed Asphalt Concrete Pavement. Limits determined by Fuller Equation (MS - 2) should be avoided. Class A shall be adopted unless specifically advised otherwise by the Engineer.

The asphalt concrete wearing course mixture shall meet the following Marshall Test Criteria:

Compaction (number of blows each end of specimen)	75
Stability (minimum) 30 minutes/60°C	1200 kg
Flow, 0.25 mm (0.01 inch)	8 - 14 (2 - 3.5)
Percent of air voids in mix	3.5 - 5.5
Minimum voids in mineral aggregate	According to Table 5.3 MS-2, Asphalt Institute, sixth edition 1993
Percent Voids filled with Asphalt	60 - 75
Loss of stability (maximum)	20



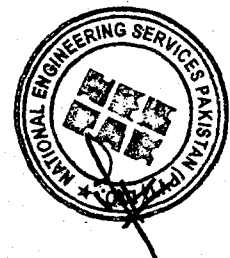
#### 305.2.4 Asphalt Concrete Job-Mix Formula (JMF)

At least eight (8) weeks prior to commencement of asphalt production, the Contractor shall start the tests for the design of a proposed JMF as described in Subsection 305.2.3 above. At least one (1) week prior to production, a JMF for the asphalt mix to be used shall be established jointly by the Contractor and the Engineer.

The JMF shall be established by Marshall Method of Mix Design according to the procedure prescribed in the Asphalt Institute Manual Series No. 2 (MS-2), Oct; 1993 Edition or the latest edition with the following recommendations taken into account:

The JMF, with the allowable tolerances shall be within the range specified in Item 305.2.3 and herein. Each JMF shall indicate a single percentage of aggregate passing each required sieve size and a single percentage of bitumen to be added to the aggregate.

- Marshall mixing temperature shall be one hundred and sixty plus/minus five ( $160 \pm 5$ ) degree centigrade at which heated asphalt produces a kinematic viscosity one hundred and seventy plus/minus twenty ( $170 \pm 20$ ) centi stoke.
- Marshall compacting temperature shall be one hundred and forty five plus/minus five ( $145 \pm 5$ ) ° C at which heated asphalt produces a kinematic viscosity of two hundred and eighty plus/minus thirty ( $280 \pm 30$ ) centi stoke.
- The combined gradation should produce a smooth curve within the master grading band for designated mix. The job-mix formula with allowable tolerances for a single test then becomes the job control grading band. If application of job-mix tolerances results in a job control grading band outside the master grading band, the full tolerances shall still apply. The asphalt content thus determined shall be used to check for compliance for stability, flow and voids filled, etc. as per the specifications. Minimum coating of bitumen film on aggregate should be 8 micron.
- The minimum bitumen binder content according to the results of the Marshall Method of Mix Design should be used provided that it will still satisfy the durability, the stability and the void content requirements.
- The optimum asphalt content shall be based on the percent asphalt content having at least 4.0% air voids for wearing course. The asphalt content thus determined shall be used to check for compliance for stability, flow and voids filled, etc. as per the specifications. Minimum coating of bitumen film on aggregate should be 8 micron.
- Prior to final approval, the proposed job mix, with a bituminous content at the permissible upper percentage limit, shall be compacted to refusal, (400 to 600 blows) and the resulting voids in the mix shall not be less than 2%.



Once JMF is established, all mixtures furnished for the project represented by samples taken from the asphalt plant during operation, shall conform thereto. Moreover upon receiving the job-mix, approved by the Engineer, the Contractor shall adjust his plant to proportion the individual aggregates, mineral filler and asphalt to produce a final mix that when compared to job mix formula shall be within the following limits.

Tolerances for Job-Mix Formula:

Sieve Size	Tolerance %
19 mm (3/4") and larger	± 5
9.5 mm (3/8") and 4.75 mm (No. 4)	± 5
2.36 mm (No. 8)	± 4
300 μm (No. 50)	± 3
75 μm (No. 200)	± 1
Asphalt Content (weight % of total mixture)	-0.2 % to +0.2 %

In addition to meeting the requirements specified in the preceding items, the mixture as established by the JMF shall also satisfy the following physical property.

Loss of Marshall Stability by immersion of specimens in water at sixty (60)<sup>0</sup>C for twenty four (24) hours as compared with the stability measured after immersion in water at sixty (60)<sup>0</sup>C for twenty (20) minutes shall not exceed twenty (20) percent. If the mixture fails to meet this criterion, the JMF shall be modified or an approved anti-stripping agent shall be used. No payment shall be made for anti stripping agent.

Test results along with samples shall be presented to the Engineer for verification and final approval of JMF.

Should a change of source of materials be made, a new JMF shall be established before the new material is used. Also, if results or other conditions make it necessary a new JMF will be required.

The density of the compacted mixes shall be related to the daily Marshall Density which shall be determined by making six standard Marshall Specimens from samples of the mix taken from behind the paver. The density of each sample shall be determined and compared with the mean value. Any individual result which varies from the mean by more than 0.015 gm/cc shall be rejected. Marshall Test shall be repeated on daily basis to establish daily Marshall Density for that particular day's work or one sample for 500 T productions. The daily Marshall



Density shall not vary from the Job Mix Design Density by more than  $\pm 1.0\%$ . Loss of stability shall be tested on other three Marshall Specimens from samples of the mix taken from behind the paver.

The assistance of the Engineer in the preparation of the job standard mix in no way relieves the Contractor of the responsibility of producing a bituminous mix meeting the requirements of the Specifications.

The compliance criteria contained in the Job Mix Tolerances provide an indication of the maximum acceptable value of the standard deviation for each parameter. If asphalt mix shows variation in excess of these limits, the source of variation shall be determined by the contractor and rectified by him to the satisfaction of the Specifications and the Engineer. If the excessive variations continue, the Engineer shall order stoppage of production and laying for the Works, until the Contractor has demonstrated his ability to re-establish acceptable control.

### **305.3 CONSTRUCTION REQUIREMENTS**

#### **305.3.1 Asphalt Mixing Plant**

As per Subsection 203.3.1 of these Specifications.

#### **305.3.2 Preparation of Aggregates**

Before being fed to the dryer, aggregates for the asphalt concrete shall be separated into two or more sizes and stored separately in cold bins. One bin shall contain aggregate of such size that eighty (80) percent will pass a 2.36 mm sieve and the other bin shall contain aggregate of such size that eighty (80) percent will be retained on the 2.36 mm sieve. Should fine material be incorporated in the mix, a separate bin shall be provided in addition to the two bins mentioned above. If filler is used as a separate component it shall also be stored and measured separately and accurately before being fed into the mixer.

Asphalt cement shall be heated within a temperature range of one hundred and thirty five to one hundred and sixty three (135-163) °C at the time of mixing. All material heated above the maximum shall be considered overheated and shall be rejected and removed from job site.

Dried aggregate weighed and drawn to pug-mill shall be combined with proper amount of asphalt cement according to the job mix formula. The temperature of asphalt, except for temporary fluctuations, shall not be lower than fifteen (15) °C below the temperature of the aggregate, at the time the two (2) materials enter into the pug-mill.

In placing the materials in bins or in moving those from bins to the mixer, any method which causes segregation or uncontrolled combination of material of different grading, shall be discontinued.

Each aggregate ingredient shall be heated and dried at a temperature not to exceed



one hundred and seventy (170) degree centigrade. If aggregates contain sufficient moisture to cause foaming in the mixture or their temperature is in excess of one hundred and seventy (170) degree centigrade, they shall be removed from the bins and returned to their respective stock piles. In no case shall the temperature of an asphalt mix exceed one hundred and sixty five (165) degree centigrade when discharged from the pug-mill.

Immediately after heating, the aggregates shall be screened to required sizes and stored in separate hot bins for batching and mixing with bituminous material.

### **305.3.3 Hauling Equipment**

As per subsection 203.3.3 of these Specifications.

### **305.3.4 Laying (Spreading)**

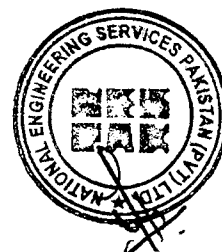
Unless otherwise directed by the Engineer, where successive layers are to be placed, the surface of existing layer shall be swept, cleaned with a power broom, or by other means as approved by the Engineer, and a tack coat is applied. Tack coat shall not be required between two lifts of Asphalt courses when previous lift is less than one day old.

Asphalt mixture shall be laid using self-contained, power-propelled units. The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The paver shall be equipped with automatic feed controls, properly adjusted to maintain a uniform depth of material ahead of the screed. It will be provided with an automatically controlled activated screed or strike-off assembly, fitted with heaters, capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and uniform thickness, required evenness and texture without tearing, shoving or gouging the mixture shown on the plans. Pavers used for shoulders and similar construction shall be capable of spreading and finishing course of Asphalt plant mix material in widths shown on the plans. The rate of delivery of material to the paver shall be so regulated as to enable the paver to be operated continuously without stoppage to ensure an even and uniform flow of material across full carriageway width, free from dragging or tearing and without segregation of the material.

When laying the mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture. The paver shall be operated at speeds which will give the best result for the type of power being used.

The mixed material shall be delivered to paver in time to permit completion of paving, finishing and compaction of mixture during day light hours.

The paver shall be equipped with automatic screed controls with sensors for either or both sides of the paver, capable of sensing grade from an outside reference line, sensing the transverse slope of the screed and providing the automatic signals





which operate the screed to maintain the desired grade and transverse slope. The sensor shall be so constructed that it will operate from a reference line or a ski-like arrangement. When the finish of the grade prepared for paving is superior to the established tolerance and, when in the opinion of the Engineer, further improvement to the line, grade, cross sections and smoothness can best be achieved without the use of the reference line; a ski-like arrangement may be substituted subject to the approval of the Engineer. The use of the reference lines shall be reinstated immediately whenever the Contractor fails to maintain a superior paving. The Contractor shall furnish and install all pins, brackets, tensioning devices, wire and accessories necessary for satisfactory operation of the automatic control equipment.

The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent variation.

Manual operation will only be permitted in the construction of irregularly shaped and or minor areas.

Whenever a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods in order to allow the contractor to use the asphalt already produced at the plant or in transit, provided this method of operation will produce results otherwise meeting the Specifications.

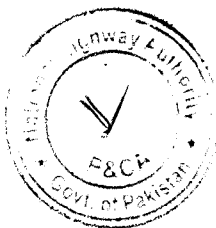
Asphalt material which is hotter than one hundred and forty (140) degree centigrade shall not be laid or deposited on bridge deck waterproofing systems unless precautions against heat damage have been agreed by the Engineer.

Asphalt concrete pavement wearing course shall not be placed on any wet or frozen surface, during rain, dust or sand storms, when wind or other weather conditions prevent the proper handling of the Asphalt mixtures or when atmospheric temperature is five (5) degree centigrade or less. Care should be taken during spreading operation under windy condition in winter, even if temperature is above five (5) degree centigrade.

The spreading operations should be immediately terminated if it begins to rain during the operation.

Hand laying of any Asphalt material will be permitted only in the following circumstances:

- a) For laying regulating courses of irregular shape and varying thickness;
- b) In confined spaces where it is impracticable for a paver to operate;
- c) For footways;
- d) At the approaches to expansion joints at bridges or viaducts;



### 305.3.5 Joints

Longitudinal joints for each course shall be offset thirty (30) centimeters from the joint in the immediate underlying course. Transverse joints shall be offset a minimum of sixty (60) centimeters from the joint of the immediate underlying course.

The Contractor will use either full width paver or two pavers in unison to avoid any longitudinal joints within the pavement width. However, where it becomes unavoidable due to break down of paver, the Contractor will ensure the leading half of half-roadway paving shall not get ahead of the trailing half of the pavement by more than half a kilometer ahead of the trailing half.

Longitudinal joints in wearing course shall, after cutting back, be of good alignment and preferably coincident with the position of carriageway markings. Except where laying in echelon, joints in wearing course shall be cut back to a vertical face and tack coated. Kerb faces, ironwork and the like in contact with wearing course shall be tack coated prior to laying of wearing course.

Longitudinal joints shall be located within fifteen (15) centimeters of the centerline of the roadway or within fifteen (15) centimeters of the centerline of a lane. Longitudinal joints shall be held to the minimum practical number. Longitudinal joints shall be formed by lapping the screed over the first layer placed, crowding a ridge of Asphalt material at the joint and crimping the ridge of material into the joint by a compaction roller while the material is hot.

Transverse joints shall be formed by cutting back the first layer placed to the full depth of the layer, removing and wasting the material, spreading new Asphalt material in sufficient quantity to create a compacted thickness equal to the thickness of the first layer. The joint shall be cross rolled with one coverage and the joint checked with a straight edge not less than four (4) meters in length. High points shall be removed and sags filled with additional Asphalt material and the joint rolled a second time. The joint shall again be checked with a straight edge, humps and sags adjusted as necessary, and rolled until the joint is complete and compacted as specified.

The outer edges of wearing course shall be cut back to a good alignment, parallel with the road alignment. This will require a small additional width of wearing course to be laid and cut back.

No payment shall be paid for this additional width and for all cutting back of wearing course. Tack coating of vertical faces will not be measured for payment.

### 305.3.6 Preparation of Base or Existing Pavement Surface

Before spreading materials, the surface of base or existing pavement on which the mix is to be placed shall be conditioned by application of a tack coat as specified.

After a tack coat is applied, it shall be allowed to dry until it is in the proper



condition of tackiness to receive the mix. The tack coat shall be applied only as far in advance of the placing of mix, as is necessary to obtain the proper condition of tackiness. Any breaks in the tack coat shall be repaired.

A thin coating of asphalt material shall be sprayed on contact surface of curbing, gutters, manholes, and other structures, prior to the asphalt mixture being placed against them.

### 305.3.7 Rollers

Rollers shall be steel wheel, pneumatic tyred and vibratory, or a combination thereof. The roller(s) shall be in good condition, capable of reversing without backlash, and shall be operated at speeds slow enough to avoid displacement of the asphalt mixture. The number and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. Vibratory rollers shall be acceptable for asphalt mixture compaction. The use of equipment, which results in excessive crushing of aggregate, will not be permitted.

### 305.3.8 Compaction

Asphalt material shall be laid and compacted in layer thicknesses which enable surface level and regularity requirements to be met and adequate compaction to be achieved. The maximum thickness of wearing course material laid in one pass of the paver shall be 5 cm.

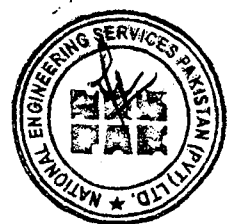
When production of the mixture can be maintained and wherever practical, pavers shall be used in echelon to place the wearing course in adjacent lanes and compacted to form a surface without lateral joint.

All mixtures shall be spread at a temperature of not less than one hundred and forty five plus/minus five (145 + 5) degree centigrade.

Material shall be uniformly compacted as soon as rolling can be effected without causing undue displacement of the mixed material and shall be substantially completed while the temperature of the mixed material is greater than hundred twenty (120) degree centigrade. Rolling shall continue until all roller marks have been eliminated from the surface.

The density achieved shall be not less than 97 percent of the Marshall Density of each day's production.

Relevant test methods for density of bituminous concrete in place by Nuclear Methods such as ASTM D 2950 (latest version) and or other method as directed by the Engineer shall be used to establish the proper rolling effort and pattern to achieve the required density and to ensure achieving the specified percent compaction during the placement of the bituminous concrete as quality control testing. A calibration factor for the Nuclear Method must be established as per the equipment's manufacture's requirements, and at any time a change is made in the



paving mixture, in construction process or after every fifteen days of asphalt production whichever is earlier. Compare the results obtained to samples compacted to Marshall Density to determine percentage of compaction.

Compaction shall be carried out using 8-10 tonne dead weight smooth wheeled rollers or by multi-wheeled pneumatic tyred rollers of equivalent mass, or by vibratory rollers or a combination of these. Wearing and base courses material shall always be surface finished with a smooth wheeled roller which may be a dead weight roller or alternatively a vibratory roller in non-vibrating mode. Vibratory rollers shall not be used in vibrating mode on bridge decks.

Vibratory rollers may only be used if they are capable of achieving at least the standard of compaction of 9-tonne dead weight roller to meet the specified percent compaction of Marshall Max. Density, and shall be equipped or provided with devices indicating the frequency at which the mechanism is operating and the speed of travel which can be read from the ground.

Three steps of rolling are as follows:

**i) Breakdown Rolling**

Breakdown Rolling may be accomplished with static or vibratory steel-wheeled rollers.

It is important to start the rolling operation on the low side of the mat (usually the outside of the lane being paved) and progress toward the high side. The reason is that hot mixtures tend to migrate toward the low side of the mat during compaction. If rolling is started on the high side, migration is much more pronounced than if rolling starts from the low side. When adjoining lanes are placed, the same rolling procedure should be followed but only after compaction of the longitudinal joint.

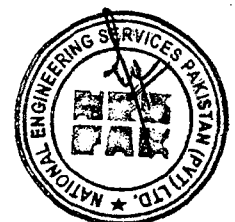
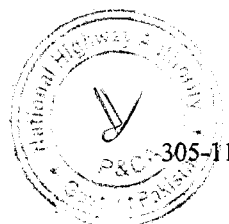
**ii) Intermediate Rolling**

Intermediate rolling should follow breakdown rolling as closely as possible, while the asphalt mix is still well above the minimum temperature at which densification can be achieved.

Intermediate rolling should be continuous until all of the mix placed has been thoroughly compacted. Regardless of the type of rollers used, the rolling pattern should be developed in the same manner as for breakdown rolling.

**iii) Finish Rolling**

Finish rolling is done solely for the improvement of the surface. It should be accomplished with steel-tired, static-weight tandems or vibratory tandems without vibration while the material is still warm enough for removal of roller marks.



The material shall be rolled in a longitudinal direction with the driven rolls nearest the paver. The roller should first compact the material adjacent to any joints and then work from the lower to the upper side of the layer overlapping on successive passes by at least half the width of the rear roll or in the case of a pneumatic tired roller, at least the nominal width of one tyre.

The smoothness of the surface and its good acceptable ride-ability as specified shall be adhered. Following points need special attention:

- a) Variation in the surface on which the asphalt course is laid shall be free from variations and be well within the allowable tolerances.
- b) The asphalt laid through the pavers will be checked immediately after initial rolling and defects will be rectified as required.
- c) Frequent stopping/starting of paver is not allowed. Paver speed should be adjusted to average rate of delivery of material, even if some trucks are delayed in dumping loads. If stop cannot be avoided, the section of pavement at the location of stop should be checked by straightedge before and after compaction.
- d) Joint should be checked with a straightedge immediately after construction and corrections made while the material is still hot. All corrections should be made with a lute. Rakes should be used only for loosening material. Poor joints must be corrected immediately, later grinding of high spots is a poor substitute for proper construction.
- e) The paver should be adjusted so that back casting of fill in low spots is not required.
- f) Irregular rolling or letting the roller stand on hot pavement is not allowed.
- g) Non-uniform asphalt mixture shall not be allowed.
- h) Pulling of mat by screed of the paver is not allowed. This results in regularly spaced, very small, cracks in mat. The compacted mat is thinner in the vicinity of cracks due to lack of material, resulting in a corrugated surface.
- i) If the truck brakes are set too hard or the paver is bumped by a truck, irregularities occur. Truck should stop before hitting the pavers.
- j) Non-uniform temperature of material is not allowed. Cold loads do not compact to the same thickness as hot loads. The temperature of each load should be checked for uniformity as per specifications before dumping.
- k) Frequent adjustment of screed controls is undesirable. Sometimes paver crews constantly change the screed controls manually in order to maintain a uniform thickness. The result is poor riding quality.



l) Ridability of the paved surface shall be checked regularly as per 305.3.10.2.

### 305.3.9 Trial Areas

At least 3 days before material from each source of the asphalt concrete is first laid in the Works, the Contractor shall lay a trial area to demonstrate the compaction plant and rolling procedure selected by him for achieving the specified density.

- a) The trial shall be not less than 200 m in length and of a width to be approved by the Engineer. If the trial area complies with these Specifications it may form part of the permanent Works;
- b) For the trial the Contractor shall use the materials, mixing and laying plant proposed for the main works.

Where the required level of compaction is not achieved the trial area shall be removed and the trial repeated.

The Engineer shall approve test results and general performance of test area before actual commencement of the work.

### 305.3.10 Surface Tolerances

#### Surface Test by Straightedge

After completion of final rolling, the finished surface shall be tested for smoothness with five (5) meters straightedge by the Engineer at selected locations. The variation of surface from testing edge of straight edge between any two (2) contacts shall be determined by placing it parallel and perpendicular to centerline of roadway and value thus determined should not vary more than limits prescribed by "Table for Allowable Tolerances" in these Specifications.

#### Removing and Replacing

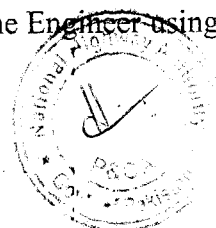
Corrections may also be made by removing the defective asphalt layer and replacing it by asphalt concrete meeting the specified requirements.

### 305.3.10 Wearing Course Thickness Tolerance

The asphalt concrete wearing course shall be compacted to the desired level and cross slope as shown on the drawing or as directed by the Engineer.

The tolerances in compacted thickness of the wearing course shall be  $\pm 3$  mm from the desired thickness shown on the drawings. For determination of thickness one (1) core per hundred meters of each lane will be taken. If the thickness so determined is deficient by more than three (3) mm, but not more than ten (10) mm, payment will be made at an adjusted price as specified in Table-1, clause 305.4.2.(2) of these Specifications.

The surface of the wearing course shall be tested by the Engineer using a 5 meters



straightedge at selected locations. The variation of the surface from the testing edge of the straightedge between any two contacts, longitudinal or transverse with the surface shall at no point exceed four (4) millimeters. The cross fall (camber) shall be with  $\pm 0.2$  percent of that specified, and the level at any point shall be within  $\pm$  three (3) mm of the level shown on the Drawings. All humps or depressions exceeding the specified tolerance shall be corrected by removing the defective work and replacing it with new material, by overlaying, or by other means satisfactory to the Engineer.

#### **305.3.11 Acceptance of Sampling and Testing**

The Engineer shall perform or supervise the performance of all quality assurance sampling and testing. The location of all samples and tests shall be recorded by roadway, lane and centerline station (kilometer).

Acceptance of sampling and testing for this item with respect to materials and construction requirements, not specified herein, shall be in accordance with the relevant "Tables for Sampling and Testing Frequency" in these Specifications.

#### **305.3.12 Surface Smoothness**

The completed asphalt wearing course shall be compacted as specified, smooth, free from ruts, humps or depressions, or irregularities. Any ridges, indentations, roller checking, or other objectionable marks left in the surface, as determined by the Engineer, shall be eliminated by whatever means are necessary and approved by the Engineer. The use of any equipment that leaves ridges, indentations or other objectionable marks shall be discontinued.

Allowable tolerances for riding quality/smoothness of finished asphalt concrete wearing course are stated in "Table for Allowable Tolerances" and Subsection 305.3.10 in these Specifications.

#### **Frequency of Testing of Cores for Compaction**

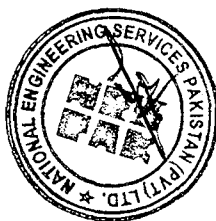
As per Subsection 203.3.9 of these Specifications.

### **305.4 MEASUREMENT AND PAYMENT**

#### **305.4.1 Measurement**

The quantity of asphalt concrete wearing course shall be measured by volume in cubic meters laid and compacted in place. Measurements shall be based on the dimension as shown on the Drawings or as otherwise directed or authorized by the Engineer. No measurement shall be made of unauthorized area or extra thickness. Quantities of material wasted or remaining on hand after completion of the work shall not be measured or paid for.

Any asphalt additive used shall not be paid directly. Its payment shall be deemed to be included in the respective pay item of Asphalt Concrete Wearing Course.



**305.4.2 Payment**

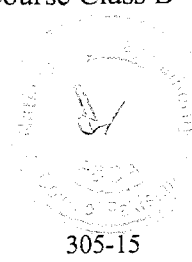
- 1) The quantity determined as provided above shall be paid for at the contract unit price respectively for each of the particular pay items listed below and shown in the Bill of Quantities, which prices and payment shall constitute full compensation for all the costs necessary for the proper completion of the work prescribed in this item. Asphalt additive or anti-stripping agent, if allowed and used to meet with JMF requirement shall not be paid directly, payment shall be deemed to be included in the respective pay items of Asphaltic wearing course.
  
- 2) **Price adjustment:** If the thickness determined as per clause 305.3.11 of this specification is deficient by more than three (3) mm, but not more than ten (10) mm, payment will be made at an adjusted price as specified in Table-1 below:

**Table - 1**

Deficiency in thickness as determined by cores	Proportional Rate of contract Price allowed
0.0 mm to 3.0 mm	100%
3.1 mm to 5.0 mm	90%
5.1 mm to 10.0 mm	80%

When wearing course is more than ten (10) mm deficient in thickness, the contractor shall remove such deficient areas and replace them with wearing course of an approved quality and thickness or the Contractor may opt to place an additional layer of wearing course asphalt, grading with a minimum thickness of 35 mm. The Contractor will receive no compensation for the above additional work.

Pay Item No.	Description	Unit of Measurement
305a	Asphalt Wearing Course Class A	CM
305b	Asphalt Wearing Course Class B	CM





**ITEM 401 CONCRETE**

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**401.1.2 TYPES OF CONCRETE**

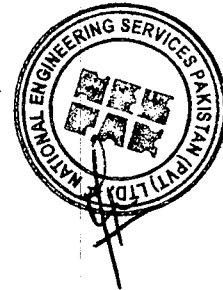
“On Ground Concrete”

In line one (1) add “minimal” after erecting. Add at the end “However walls for culvert shall be considered in elevated concrete”.

**401.4 MEASUREMENT AND PAYMENT**

**401.4.1 Measurement**

In para three (03) add at the end “against per cu.m of concrete”.



# Special Provisions



## SP 117a FORMATION OF GRANULAR MATERIAL PLATFORM

### 117.1 DESCRIPTION

This work shall consist of the formation of embankment in areas of soft embankment foundation, high water levels, where compaction of natural ground is unable to achieve the density required in Item 104 with the prescribed general method. This would also include the wet areas which cannot be dried by scarifying or other measures and which exhibit moderate to severe heaving of surface during proof-rolling.

The embankment shall consist of a working platform of the granular material followed by the embankment fill material at toe of the embankment, all placed in accordance with these specifications and the specifications for other work items involved and in conformity with the lines, grades, sections and dimensions shown on the drawings or as directed by the Engineer's Representative.

### 117.2 MATERIAL REQUIREMENTS

#### 117.2.1 Subgrade/Embankment

The subgrade/embankment material shall be as per Clause 109 and 108 respectively of General Specifications.

#### 117.2.2 Granular Material Platform

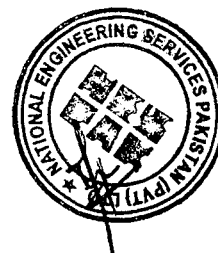
The material for the working platform shall consist of normal or processed granular fill material obtained from borrow excavation or quarry waste. This material shall conform to the following Specifications:

Size	%age of Weight Passing Mesh Sieve AASHTO T-27
37.5 mm	100
10 mm	75 - 100
# 4	60 - 80
# 10	45 - 65
# 40	25 - 40
# 100	0 - 15
# 200	0 - 5

It shall also be checked that selected grading is such that intrusion into the working platform material of subgrade or natural ground surface material is not allowed. For this condition to be met it will be required that the ratio as below shall be checked and followed:

$$\frac{D15 - (\text{Granular Fill Material})}{D85 - (\text{Natural Ground Material})} < 5$$

D85 and D15 mean the practical diameters corresponding to 85% and 15% respectively, passing (by weight) in a grain size analysis.



## 117.3 CONSTRUCTION REQUIREMENTS

### 117.3.1 Subgrade/Embankment

The subgrade / embankment above the granular material platform shall be compacted to 95% AASHTO T-180 D regardless of zone of embankment within which it falls.

### 117.3.2 Granular Material Platform

Prior to laying of granular material platform, the pond water of water logged area upon which embankment is to be placed, shall have been dried and drained or kept drained of all surface water prior to commencing of fill and all clearing and grubbing shall have been performed, manually if necessary, in accordance with the relevant specifications.

Construction of the granular fill layer shall proceed from one end of the soft area by using the granular fill as a ramp for further granular fill transport. The thickness of the granular fill working platform, as prescribed shall be as shown on the Project drawings or as directed by the Engineer's Representative and the width shall be that of the embankment or part as directed by the Engineer's Representative. The placement and compaction of the working platform including boxing material shall be carried out by the use of appropriate light equipment, in layers, if necessary. The placement, spreading and compaction of the Granular Material Platform shall be carried out by using light equipment. The top 15 cm of the platform shall be compacted to at least 90% AASHTO T-180 density.

In those areas of high water levels and salinity with soft subsoils and where embankments are high such as approach fills to structures, special provisions shall be made to measure and determine likely fill settlements which may occur. These preconditions are necessary in order to specify particular construction procedures which may be necessary and to establish the time at which the pavement structure can be placed to avoid cracks and subsidence of these layers.

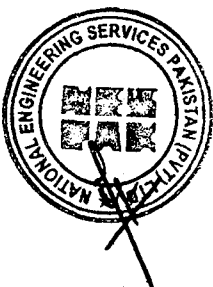
In particular, additional compaction of the fill material and its adequate protection shall be required to prevent and underscore the risk of "collapse" settlement.

No extra payment under this item shall be made to the Contractor for re-working, re-instatement, replacement of granular material which has become slushy, or replenishing of granular material for whatever reason.

## 117.4 MEASUREMENT AND PAYMENT

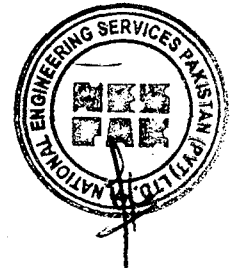
The quantities measured against this item as shown on the drawings with respect to line and grades shall be paid for at the contract unit price for the pay items listed below and shown in the Bill of Quantities. These prices and payments shall constitute full payment and compensation for providing including hauling, processing, placing at site and compacting as specified, replenishing granular material for remedying loss of material due to traffic and sinking of granular material platform during construction due to whatever reason, including all equipment, labour, material and all other costs related to the completion of works in all respects.

On first-time completion and approval of granular material platform, only 75% payment for pay item SP 117a shall be made to the Contractor. Balance 25%



payment for pay item SP 117a shall be made to the Contractor only when the granular material platform is no more required to serve as detour road and it has been re-worked, re-instated or replaced as directed by the Engineer's Representative and is re-approved and ready to receive oncoming layer of embankment.

Pay Item No.	Description	Unit of Measurement
SP-117a	Formation of Granular Material Platform.	CM



SP 117b      FORMATION OF EARTHEN DOWEL

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**117.1 DESCRIPTION**

This work shall consist of construction of earthen dowel at shoulder edge on both sides of carriageway as shown on the drawings and or as directed by the Engineer.

**117.2 MATERIAL REQUIREMENTS**

The material for earthen dowel shall be any suitable soil obtained from roadway excavation, borrow excavation or any other source as approved by the Engineer having a plasticity index of 6 or more. The material shall conform to the requirements of clause 108 of the specifications. It should be free of organic and other deleterious substances.

**117.3 CONSTRUCTION REQUIREMENTS**

The earthen dowel shall be constructed at shoulder edge on both sides of carriageway as per dimensions shown on drawings or as directed by the Engineer. No specific density requirements are specified for earthen dowels, it shall be as directed the Engineer. Preferably they shall be graded and compacted with at least two passes of vibratory roller to the satisfaction of the Engineer.

**117.4 MEASUREMENT AND PAYMENT**

The quantities measured against this item as shown on the drawings with respect to line and grades shall be paid for at the contract unit price for the pay items listed below and shown in the Bill of Quantities. These prices and payments shall constitute full payment and compensation for providing including hauling, processing, placing at site and compacting as specified including all equipment, labour, material and all other costs related to the completion of works in all respects.

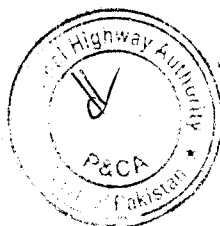
Pay Item No.	Description	Unit of Measurement
SP-117b	Formation of Earthen Dowels.	CM



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**SP-414 SOIL INVESTIGATIONS AT BRIDGE SITES**

**414.1 SCOPE OF WORK**



The Contractor shall carry out confirmatory boring at bridge and Flyover sites at locations marked on the drawings or as directed by the Engineer's Representative.

The purpose of the Work specified herein is to determine the type, nature, arrangement, thickness and texture of the various subsurface strata, the conditions and the Engineering characteristics of the subsurface materials as they exist to the depth and at the locations specified. This is to be accomplished by means of drilling, in-situ testing, collection of disturbed and undisturbed soil and water samples and laboratory testing.

The Contractor shall carry out the specified works under the supervision of the Engineer's Representative.

#### **414.1.1 Plant and Equipment**

The Contractor shall keep at-least one rotary drill machine and one percussion winch along with accessories on the site to meet the requirements of the Work. The plant and equipment shall be in good operating condition and capable of performing efficiently the Work as set forth.

#### **414.1.2 Drillers and Supervisory Staff**

The Contractor shall provide qualified, experienced, orderly and thoroughly competent persons at all times including geotechnical engineers or engineering geologists who shall conduct and supervise drilling, sampling, logging and in-situ testing at the site. The Contractor shall remove any of his employees from the site that in the opinion of the Engineer does not meet these requirements.

The Contractor shall make his own arrangements for housing of his personnel, security and storage of the equipment and supplies at the site.

#### **414.1.3 Setting up at each Hole**

The Contractor shall make all the necessary arrangements for setting-up plant and equipment at each location, carrying out the work specified, preparation and reinstatement of the work areas, improvement to access routes and all other temporary works.

#### **414.1.4 Measurement of Quantities**

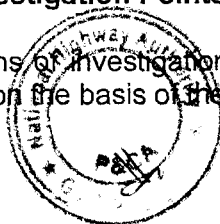
The quantities shown in the Bill of Quantities are only approximate. The payment shall be made on the basis of actual work performed in accordance with the Specifications.

#### **414.1.5 Submission of Field and Laboratory Data**

The Contractor shall supply complete field and laboratory investigation data to the Engineer's Representative within the time set-forth for completion of works. This data shall include copies of all the approved logs and test records provided during the course of the Contract including any alterations or amendments required by the Engineer's Representative.

#### **Location of Investigation Points**

- a) The locations of investigation points shall be established in the field by the Contractor on the basis of the Drawings to be provided later or as directed by



the Engineer's Representative. Locating the boreholes accurately in the field shall be the sole responsibility of the Contractor.

- b) It is to be understood that further Drawings may be issued by the Engineer showing the revised locations of investigation points.
- c) All the investigation points shall be located by the Contractor through field survey to an accuracy of 1 m in plan and 0.05 m in ground elevation.

## **414.2 WORK METHODOLOGY**

### **414.2.1 Investigated Areas**

The location of the boreholes will be selected as directed by The Engineer. The Engineer will specify from time to time during the Contract period, the exact location and reference number of all holes. To locate the holes accurately in the field shall however be the Contractor's responsibility.

### **414.2.2 Casing**

A hole shall be cased in any stratum which is friable or not sufficiently strong to stand unsupported, or as and when directed by the Engineer's Representative.

The Contractor shall ensure that casings are of a suitable size and inserted in such a manner as to render them recoverable. The Contract Rates for drilling shall be deemed to include the supply, insertion and recovery of casing including any damage, loss or delay caused by difficulty or failure in recovering casing.

### **414.2.3 Removal of Casing**

Casing shall neither be removed from any hole nor any filling introduced into it until permission is given by the Engineer. This permission will normally be given as soon as work in the hole is completed and the groundwater level has been measured.

As far as possible the Contractor shall avoid leaving a hole overnight after he has begun to withdraw the casing and before he has finished.

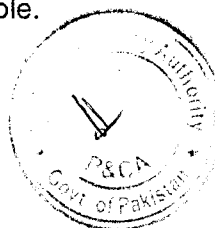
### **414.2.4 Supplementary Holes**

Abandoned holes and / or the holes from which unsatisfactory samples have been obtained and/or in which unsatisfactory field tests have been performed due to the negligence of the Contractor shall be supplemented by other holes adjacent to the original location. The exact location of such supplementary holes shall be specified by the Engineer in the field.

The depth where the unacceptable holes were abandoned or to the depths where unsatisfactory samples were obtained or unsatisfactory field testing was performed may be made by any method selected by the Contractor that in the opinion of the Engineer will permit satisfactory field testing and sampling below those depths at which original hole was abandoned shall be carried out using only the specified method of advancing the hole.

No payment will be made for that portion of the supplementary hole above the depth paid for in the unacceptable hole.

### **414.2.5 Groundwater Level**





The groundwater level in holes shall be determined after completion of the hole or when required by the Engineer, as follows:

Clear water shall be added or the hole shall be bailed-out as necessary to bring the water level to the expected groundwater level as directed by the Engineer and the water level shall be measured and recorded at intervals of 6 hours for a period of twenty four (24) hours thereafter.

#### **414.2.6 Backfilling Holes**

Boreholes shall be backfilled with grout as directed by the Engineer.

Grouting for backfilling holes shall consist of a mud formed by mixing one (1) part by weight of bentonite with ten (10) parts of water, to which two parts by weight of cement shall be added after the bentonite and water have been thoroughly mixed. Alternatively, holes may be backfilled with purpose-made pellets of bentonite or bentonite/cement, provided they are of a size which, in the opinion of the Engineer, is compatible with the size of hole. If there is no standing water in the hole, grout may be poured in from the top. If there is standing water in the hole, the grout shall be fed into the bottom of the hole by a tremie pipe, the end of which shall always be below the groundwater junction while grouting is being carried out.

Grout backfill shall be taken up to 30 cm below the original ground level. Any apparent loss of grout due to leakage or consolidation within one week shall be made-up with fresh grout and then the remaining depth of the hole shall be filled with concrete.

#### **414.2.7 Logs**

Logs of boreholes shall be provided on an approved specimen. These shall include descriptions of all strata including details of the soil macrofabric (such as frequency, orientation and nature of fissures) and details of samples taken, and an account of all observations and field tests. Logs of boreholes shall include notes on the nature, quantity and colour of the drilling fluid returns. All logs shall be subject to the approval of the Engineer and two draft copies shall be submitted to the Engineer, not more than two days after the hole is backfilled. Soil descriptions shall conform to ASTM designation D 2488 and classified according to ASTM designation D 2487. All depths and thicknesses of topsoil and strata shall be recorded in meters and all reduced levels shall be recorded in meters with reference to Survey of Pakistan datum. Accurate determination of ground levels at all the hole points is the Contractor's responsibility for which no extra payment shall be made.

#### **414.2.8 Contractor's Responsibility for Records**

The presence of the Engineer or any of his staff and their keeping separate drilling records shall not relieve the Contractor of any of his responsibilities for keeping records.

#### **414.2.9 Order of Work**



The order in which the work is to be accomplished shall be determined and approved in the field by the Engineer.

### **414.3 DRILLING**

#### **414.3.1 Depth of Drilling**

Drilling would generally be required up to a minimum of 45 meters depth or at least 5 m below the pile tip level, whichever is more or as directed by the Engineer.

#### **414.3.2 Accuracy of Alignment of Holes**

Boreholes will be within 2 degrees of the vertical unless the Engineer's Representative has ordered the drilling of an angled hole in which case the hole angle shall be within 5 degrees of the angle specified.

#### **414.3.3 Drilling Plant**

The drilling plant and ancillary equipment to be mobilized at the site should be adequate to advance the boreholes in an efficient manner, to the required depths.

Rotary drilling rigs shall be of the hydraulic feed type equipped with side discharge type fish tail and tricone bits for drilling. Bits and casing shall conform to B.S. 4019; Part I; 1974 or an approved equivalent.

Drilling bits shall be of side discharge type designed to prevent unnecessary disturbance of soil at bottom of the hole by flow of drilling fluid, unless the Engineer directs otherwise.

#### **414.3.4 Drilling Procedure**

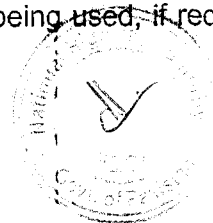
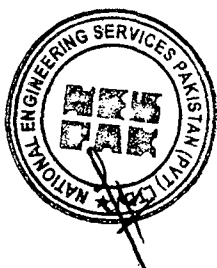
The method of drilling shall be of any approved standard and accepted method by means of which a hole of specified diameter is extended to the desired depth. The normal method of drilling shall be rotary unless gravelly strata are encountered where percussion may be used.

During drilling the Contractor shall regulate the drilling operation which ensures minimum disturbance in the underlying material in which the in-situ testing and sampling is to be carried out.

In rock, core drilling shall be carried out in such a manner and using such sizes of bits, that the maximum core is recovered. This requires close surveillance of the flushing media, drilling pressures, lengths of runs, use of appropriate core barrels and other factors relevant to the nature of the material drilled. The drill bit shall be withdrawn and core removed as often as may be necessary to secure the maximum possible amount of core. In soft or friable formation, dry drilling techniques may be required using single tube core barrel with tungsten carbide bits as directed by the Engineer. The cores would be placed in core boxes in a proper manner.

#### **414.3.5 Stabilizing of Holes**

Drilling mud of suitable consistency shall be used during rotary cum wash boring to stabilize the walls of boreholes by preventing caving-in and to avoid disturbance of the sampling horizons. The drilling mud shall be a mixture of bentonite and water with approved chemical additives being used, if required, to



assist in modifying its density and viscosity. The density and viscosity shall be selected considering such factors as hole stability, cutting operation and undisturbed samples recovery.

Where drilling mud is not effective, casing of appropriate size and strength may be used subject to the approval of the Engineer. It will be responsibility of the Contractor to use appropriate means to stabilize the walls of the boreholes.

It shall be ensured that there is no jetting action of the drilling fluid. The minimum amount of drilling fluid necessary to carry away the cuttings shall be used. During drilling the Contractor shall regulate the pressure of the drilling fluid to ensure minimum disturbance to the underlying material in which the in-situ testing and sampling is to be carried out.

#### **414.4 SAMPLING**

##### **414.4.1 General**

The Contractor shall take disturbed or undisturbed samples from any borehole when ordered to do so by the Engineer. This shall include the provision of all necessary sampling equipment, tubes and containers, crates and boxes, as well as handling and transportation to the approved laboratory or store at site.

##### **414.4.2 Approval of Equipment**

No equipment or containers shall be used unless and until approved by the Engineer.

##### **414.4.3 Care of Samples**

The Contractor shall be responsible for the safe keeping of samples of all kinds until these have been handed over to the designated laboratory or disposed of on the Engineer's instruction as the case may be. Any sample lost, damaged or showing signs of deterioration while in the Contractor's care shall be replaced by the Contractor at no expense.

##### **414.4.4 Labeling Samples**

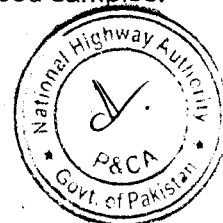
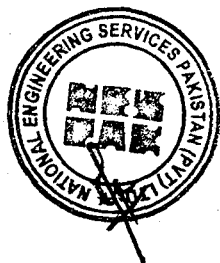
All disturbed and undisturbed soil samples and water samples taken from holes shall be clearly labeled. Each label shall include the following information:

- a) Name of Contract
- b) Reference number of the holes
- c) Reference number of sample
- d) Date of sampling
- e) Brief description of the sample (e.g. stiff brown silty clay)
- f) Depth of the top and bottom of the sample below ground level
- g) Number of the sampler tube

Tubes and crates for undisturbed samples shall be labeled "Do not jar or vibrate" and "Haul and transport in a horizontal position".

##### **414.4.5 Disturbed Samples**

In all the boreholes, small disturbed samples shall be taken at the top of each stratum, and at intervals as directed by the Engineer. Material from the cutting shoes of open drive undisturbed samples, and from the split spoon sampler used for Standard Penetration Tests, shall also be taken as disturbed samples.



#### 414.4.6 Undisturbed Sampling

Undisturbed sampling from boreholes shall be done by Shelby tube or Pitcher/Denison sampler or as directed by the Engineer. The undisturbed samples should be properly sealed and preserved as directed by the Engineer.

#### 414.4.7 Cores

The cores obtained from boreholes shall be carefully removed from the core barrel and placed in the boxes in the correct sequence, with increasing depth from left to right and top to bottom in the box. Coloured photographs of cores shall be taken at site.

Where the core is contained in an expandable triple tube liner, the ends of the tube shall be sealed and waxed as directed by the Engineer.

Each core run shall be segregated by labeled wooden blocks 25 mm thick and the depth of the bottom of each run shall be marked on the partitions in the core box with paint.

No box shall contain more than 3 meters of core.

#### 414.4.8 Core Samples

Selected cores, preferably not less than 30 cm in length, shall be preserved as core samples. The preservation would consist of clearance of any loose sludge, waxing of cores, packing in wooden boxes using sawdust and labeling before transportation to the testing laboratory.

#### 414.4.9 Water Samples

The Contractor shall take water samples from holes when directed by the Engineer before the addition of water to the hole unless it is unavoidable. If necessary, the hole shall be bailed-out before taking the sample to ensure that any potential contaminant is removed. No fuel or other potential contaminant shall be allowed to enter the hole. The method of sampling shall be as approved by the Engineer. Samples shall only be stored in approved, air tight and scrupulously clean, containers and shall not be less than 1 litre in volume.

#### 414.4.10 Transportation of Samples

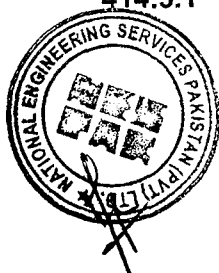
All samples shall be shifted to the store at the site, the day they are collected. Samples in tubes shall be kept and transported with the tubes in a horizontal position.

The samples shall be continuously transported to the testing laboratory on conclusion of every borehole and on the instructions of the Engineer. The laboratory for testing shall be approved by the Engineer.

#### 414.5 IN-SITU TESTS

##### 414.5.1 Standard Penetration Tests (SPTs)

When directed by the Engineer the Contractor shall carry out Standard Penetration Tests (SPTs) in boreholes. The penetration resistance 'N' shall be expressed as the number of blows of a 63.5 kg hammer freely dropping 76.2 cm required to force the standard split tube sampler 30.5 cm into the soil.



Standard Penetration Test (SPTs) shall be conducted in the boreholes in accordance with ASTM 1586 generally at 1 meter depth interval or as directed by the Engineer at the site.

#### 414.6 LABORATORY TESTING

##### 414.6.1 General

The samples shall be tested in a laboratory approved by the Engineer. The Engineer shall have access to the laboratories to supervise and check the laboratory testing of the samples. The testing shall be carried out in accordance with ASTM, BSS or AASHTO Standards or as directed by the Engineer. The Contractor shall arrange to carry out the following laboratory tests on the specified samples of the subsoil materials. The samples to be tested and the tests to be carried out for each sample shall be specified by the Engineer.

##### 414.6.2 Type of Tests

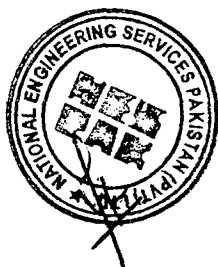
Sr. No.	Name of Test	Standard
i.	Grain size analysis	ASTM D 422
ii.	Liquid limit, plastic limit	ASTM D 4318
iii.	Specific gravity	ASTM D 854
iv.	Unit weight of soil	
v.	Unconfined compression (soil)	ASTM D 2166
vi.	Unconfined compression (rock)	ASTM D 2938
vii.	Natural moisture content	ASTM D 2216
viii.	Consolidation	ASTM D 2435
ix.	Direct shear	ASTM D 3080
x.	Triaxial compression test	ASTM D 4767
xi.	Sulphate content of Soil	BS 1377
xii.	Organic matter content of soil	BS 1377
xiii.	Total dissolved salts of soil	BS 1377
xiv.	Chloride content of soil	BS 1377
xv.	Chemical analysis of water	BS 1377
	a) Sulphate content of water	
	b) Total dissolved salts of water	
	c) Chloride content of water	
	d) pH of water	

#### 414.7 RECORDS AND REPORTS

##### 414.7.1 Records

a) The Contractor shall keep accurate logs and records of all work accomplished under this item. All such records shall be preserved in good condition and order by the Contractor until these are delivered and accepted by the Engineer. The Engineer shall have the right to examine such records at any time prior to their delivery to him. Separate logs shall be made for each borehole. The following information shall be included on the logs or in the records for boreholes:

- i. Borehole number or designation and elevation of top of borehole.
- ii. Method of drilling holes.



- iii. Dates and time by depths when hole was performed.
  - iv. Type of drilling fluid used.
  - v. Depths at which samples were recovered or attempts made to collect samples along with designation, thickness and type.
  - vi. Record of SPT on borehole log.
  - vii. The classification or description by depth of the materials samples including a description of condition of compactness or stiffness of soil materials encountered and moisture conditions.
  - viii. Depth of groundwater level if encountered.
  - ix. Depth of bottom of borehole.
- b) The Contractor shall furnish the Engineer with the record as specified above in duplicate, not later than 48 hours after completion of each borehole.
  - c) The presence of Engineer or the keeping of separate records by the Engineer shall not relieve the Contractor of the responsibility for the work specified in this Section. Payment shall not be made for any work for which the records have not been furnished by the Contractor.

#### 414.7.2

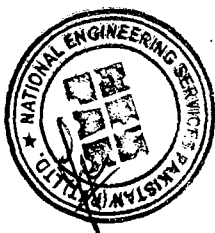
#### Reports

- a) The results of each borehole and the field tests carried out shall be communicated to the Engineer as follows:
  - i. Oral reports as the work proceeds.
  - ii. Three sets of complete data of the work within two (2) days of the date of completion of borehole.
- b) The data shall comprise:
  - i. A site plan showing the position of the boreholes and giving their map reference.
  - ii. The borehole logs
  - iii. Complete results of field tests
  - iv. Comments on any point which the Engineer has put-up to the Contractor for inquiry and investigation during the Works.
- c) Complete results of laboratory tests shall be communicated to the Engineer within seven (07) days of the date of completion of borehole.

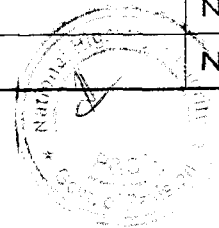
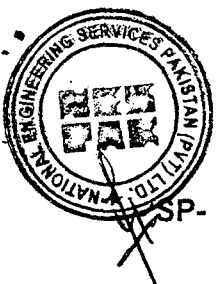
#### 414.8

#### MEASUREMENT AND PAYMENT

The measurement and payment for the Work specified in the Contract for drilling of bore holes, collection of disturbed, undisturbed and rock core samples, performing the standard penetration tests, laboratory testing and compilation and submission of results shall be done and paid for as per the pay item given in the BOQ, which payment shall be full compensation for furnishing all labour, material, tools, equipment and incidentals and for performing all the work involved in this item as mentioned above in this specification.



Pay Item No.	Item Description	Unit
SP-414 (a)	6" minimum dia drilling straight rotary/ Percussion including back filling of holes from NSL upto 45m depth or till the rock level which ever is met earlier.	LM
SP-414(b)	Perform SPT at 1 m interval i/c collection, preservation & Transportation of disturbed samples to an approved Laboratory.	No.
SP-414(b-1)	Continuous core drilling in bedrock up to a maximum of 5 m depth below rock strike level, including determination of core recovery/ RQD, preservation of core samples in core boxes, labelling, waxing of selected core samples, photography of rock cores and transportation of core samples to the laboratory. In case core recovery is less than 80% reduce run length to 0.5 m.	LM
SP-414(c)	Collection of undisturbed soil samples from boreholes using Shelby pitcher/denison sampler i/c preservation and transportation of samples to an approved Laboratory.	No.
SP-414(d)	Performance of FDT in test pits through sand replacement method i/c moisture content determination.	No.
SP-414(e)	Excavation of testpits upto 1.5 m depth along road allignment including backfilling of pits to original condition.	M
SP-414(f)	Collection of undisturbed block samples from test pits at appropriate location as directed by the Engineer.	No.
SP-414(f1)	Collection of composite bulk sample (atleast 60 kg for sandy/clayey soils and 120 kg for gravelly soils)	No.
SP-414(g)	Collection & preservation of water samples from bore holes & transportation to an approved Laboratory.	No.
SP-414(h)	Laboratory Testing	No.
i.	Grain size analysis.	No.
ii.	Hydrometer analysis.	No.
iii.	Atterberg limits	No.
iv.	Specific gravity	No.
v.	Natural moisture content	No.
vi.	Bulk density & Dry density (Soil/rock cores)	No.
vii.	Direct shear test	No.
viii.	Consolidation test (collapse/swell potential)	No.
ix.	Unconfined compression test (Soil/rock cores)	No.
x.	Chemical analysis of soil	No.
xi.	Chemical analysis of water	No.
xii.	Submission of Investigation Report (triplicate)	No.
xiii.	CBR	No.
xvi.	Modified Proctor Test	No.



**1. General**

Expansion joints will follow Specifications of AASHTO-SS-Division II-section 19 "Bridge deck joints seals"

The Contractor shall submit to the Engineer, complete documentations about the Expansion joints he intends to use for the movements shown on the Drawings, including references of the last 10 years, material Specifications for metal, rubber and bonding between them, fixations, and test certificates from authorized laboratories showing that the proposed joints meet the specifications.

Elsewhere the submittal will be accompanied by samples of at least 0.50m, with its fixations.

The expansion joints shall satisfy the following functional requirements:

1. It shall withstand traffic loads of the highway, and accommodate movements between the deck and abutment or the adjacent deck.
2. It shall have good riding quality and shall not cause any inconvenience to road user.
3. It shall not cause skidding hazard.
4. It shall not generate excessive noise or vibration during the passage of vehicles
5. Parts liable to wear out shall be easily replaceable.
6. It shall be watertight and will have provision for carrying away water and silt.
7. It shall be easy to inspect and maintain.
8. It shall be resistant in hot and very sunny climate.

**2. Construction Requirements**

The methodology of placing the expansion joint will be clearly described by the Contractor with a complete set of drawings.

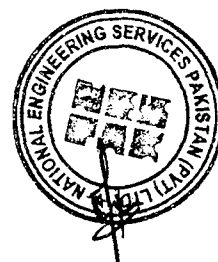
Connection or overlapping between roadway and walkway expansion joints will be clearly shown.

Connection with water proofing of the deck will be detailed.

All necessary provisions in deck reinforcement will be indicated.

Initial gap at the time of placing will be clearly indicated and justified.

The second stage reinforced concrete for fixations, if any, will be Class Y concrete and will be included in pay item SP- 417.





### 3. Measurement and Payment

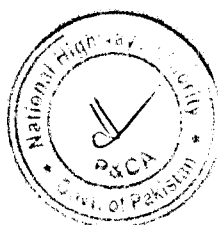
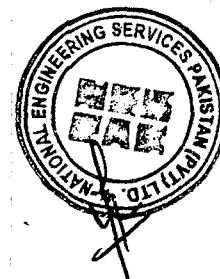
#### 3.1 Measurement

The length of computed joints for roadway is measured in linear meter between the faces of the kerbs, plus 150 mm height on each bridge railing.

#### 3.2 Payment

The accepted quantity measured as provided above shall be paid for at the contract unit price respectively for the pay items listed below and shown in the Bill of Quantities which price and payment shall be full compensation for furnishing all materials, labour, equipment, tools and incidentals and any work pertaining to expansion joints and which is not paid for separately, necessary to complete the item.

Pay Item No	Description	Unit of Measurement
SP-416	Manufactured trade mark expansion Joints for roadway, for (25-30) mm movement	M



**SP-417 BITUMEN COATING**

**417.1**      **Scope**

The work under this section of the Specifications consists of furnishing all plant, labour, equipment, appliances and materials and in performing all operations related to water proof treatment to foundations and basement structures complete in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the Contract.

**417.2**      **Submittal**

Samples of all materials proposed for use under this section shall be submitted to the Engineer for approval.

**417.3**      **Materials**

Bitumen 10/20 grade.

**417.4**      **Delivery Storage and Handling**

Materials shall be protected from damage during loading shipment delivery and storage. Non-staining materials shall be used for blocking and packing.

**417.5**      **Preparatory Work**

All surfaces to be treated shall be dust free and dry. Application of finishes shall not start unless the preparatory work has been inspected and approved by the Engineer.

**417.6**      **Bitumen Coating / Painting In Foundation Sub-Structures, Under Floors**

Bitumen Painting

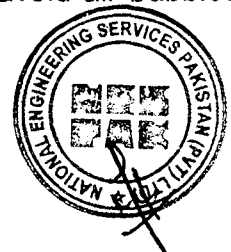
All surfaces to be bitumen painted shall be thoroughly cleared of any accretion, dust, dirt etc. by scraping, wire brushing or as directed by the Engineer. The surface shall be primed with a coat of asphalt oil used at the rate of not less than 0.5 liters per square meter. Two coats of hot bitumen paint shall be applied at the rate of 1.0 kg/Sq.m each coat. The first coat shall be allowed to dry for about 6 hours before applying the second coat. During operation of painting great care shall be taken to avoid air bubbles. The manufacturer's instructions shall be followed.

**417.7**      **Measurement and Payment**

**417.7.1**      **Bitumen Coating**

**417.7.1.1**      **Measurement**

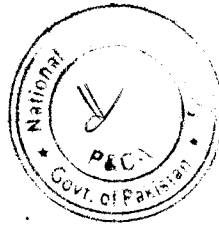
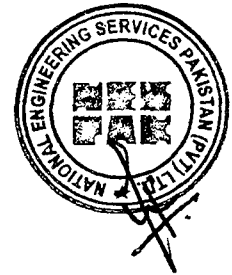
Measurement for compliant completed works will be made on the basis of actual area coated in square meter as shown on drawings or as directed by the Engineer. All openings left in area shall be deducted.



417.7.1.2 **Payment**

Payment will be made for agreed measured quantity of work on the basis of unit rate per square metre quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

Pay Item No	Description	Unit of Measurement
SP-417	Bitumen Coatings to Cement or Concrete surface using 0.60 Kg/sq.m.	SM



**614.1 DESCRIPTION**

The work shall consist of supply and installation of delineators /angle reflectors at locations detailed on drawings or as directed by the Engineer, complete in all respect. The work will be executed as per item 607 "Traffic Road Signs and Safety Devices of general specifications with amendments as follows:

In item 607 "Traffic Road Signs and Safety Devices" of general specifications, add in line 1, after "furnishing" insert ",", delete "and" and after "traffic signs" insert "and delineators"

Add at the end of para:

Unless otherwise shown on the Drawings, all signs shall be lettered in both Urdu and English. In case of any discrepancy between NTRC requirements and General Specifications, the requirements of NTRC shall govern.

**614.2 MATERIAL REQUIREMENTS**

In item 607 "Traffic Road Signs and Safety Devices" of general specifications, add new para under head "Material Requirement" as follows:

Materials shall be of new stock unless otherwise shown on the Drawings or ordered by the Engineer's Representative and shall conform to the item 607 of general specifications with amendments as mentioned below:

**614.2.2 Rubber Washer**

In 607.2.6, Add at the end "Thickness of rubber washer is as given below:

On top	3 mm
On Bottom	2 mm

**614.2.3 Concrete Foundation Blocks**

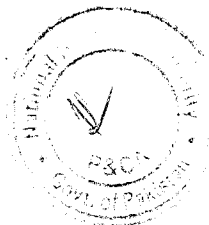
In 607.2.9, in line 1, delete "Class A" and replace with "Class A1".

In line 3, after "mm", add "or as shown on the drawings or as directed by the Engineer."

**614.2.4 Road Posts and Hazard Markers**

In 607.2.10, in line 6, delete "with standing" and replace with "withstanding".

**614.2.4 Excavation and Backfilling**



In 607.3.1, Add at the end of para 3:

Concrete shall be placed against the undisturbed excavated faces, except that the top fifteen (15) centimeters of each footing shall be formed. Forming of the entire footing will not be permitted unless approved by the Engineer. Concrete shall be thoroughly rodded and spaded so as to eliminate all voids. Tops of footings shall be finished with a wood float and all exposed edges shall be rounded with an edger.

Backfill shall be thoroughly compacted by mechanical tampers, and care taken to prevent damage to the finished concrete. Backfill shall be brought up level with the finished ground line. Pipe post bases and/or posts set in concrete shall be firmly supported, plumb, vertical and at the proper elevation.

In case precast concrete foundations are used, these shall be of the concrete class 'A1' and of the sizes as shown on the drawings. \_\_\_\_\_

**614.2.5 Erection of Posts**

In 607.3.2, In line 3, delete "the" written in between "to" and "prevent".

**614.2.6 Installations of Safety Devices**

In 607.3.5, In line 11, delete "a" written in between "for" and "prohibiting".

**614.2.7 Sign Faces**

In item 607.3.6, following amendments be made as mentioned below:

**a) Design**

In serial No. 3, line 1, delete "italics" and replace with "Smalls".

In serial No. 4, delete "21 cm" and replace with "35 cm".

In serial No. 5, delete "17 cm" and replace with "25 cm".

In serial No. 5, delete "italics" and replace with "Small".

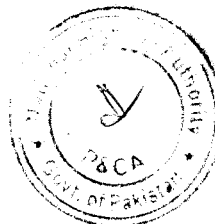
In serial No. 6, delete "3.5 cm" and replace with "10 cm".

In serial No. 10, delete "4 cm" and replace with "2.3 cm".

In serial No. 11, delete "23 cm" and replace with "35 cm".

In serial No. 13, delete "Size of letter for km. Height" and replace with "Height of letter for km".

**614.2.8 Storage of Signs**



After 607.3.7, add the following:

**614.2.9**      **Painting**

The rear sign face of all signs shall be painted with two (2) coats priming paint pigmented with chromates of chromes (excluding lead chromes) plus two (2) coats of weather-resisting dull silver gray paint. Where connection of large aluminum sheet signs to a steel stiffening frame is required, the studs or screws, bolts and washers shall be painted to properly match the color of the surrounding material.

All painting shall conform to the requirements of Section 413 of General Specifications.

**614.2.10**      **Placement and Orientation**

The Engineer will approve and mark the longitudinal location of each sign on the working drawings submitted by the Contractor.

The sign shall be laterally positioned from the shoulder or curb as shown on the approved drawings or directed by the Engineer.

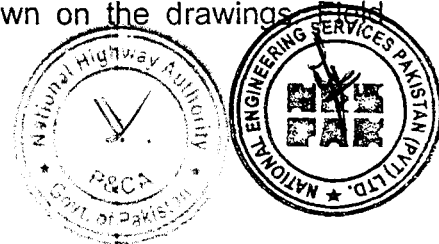
The Contractor shall stake the location of each sign support and shall get its approval from the Engineer prior to carrying out excavation for foundations. The Engineer may order change in location due to site constraints. No separate payment shall be made to the Contractor on account of such change if the change is made before fixing of the sign support in concrete block.

The Contractor shall be responsible for the proper elevation, off-set, level and orientation of all signs he erects. He shall exercise due care on the preservation of stakes for his and the Engineer's use. If any stakes are lost, damaged, displaced, or removed, the Contractor shall have them reset at his own expense.

Unless otherwise shown on the drawings all signs shall be erected so that the edge and face of the sign are truly vertical and face is at an angle of ninety three (93) degrees to the centerline; that is, facing slightly away from the centerline of the lane which the sign serves. Where lanes divide or are on sharp curves, the Contractor shall orient sign faces as indicated on the Drawings or by the Engineer so that they will be most effective both during day and night and so as to avoid specular reflection and glare. All sign supports shall be plumbed.

**614.2.11**      **Sign Posts**

Lengths of posts shown on the drawings for signs are for bidding purposes only. When progress of the work permits, the Engineer will authorize the location of each sign, with the station and offset distance from the edge of pavement. The Contractor shall be responsible for determination of post lengths to provide the vertical clearance shown on the drawings. Field cutting of posts shall be performed by sawing.



"Sign Post Support Assemblies" shall be fabricated as detailed on the drawings. Test specimens for pipe shall be taken at least fifteen (15) centimeters from one (1) end of the pipe, instead of at the ends as specified in ASTM A 53, Grade B. When Galvanizing is specified assemblies shall be hot-dip galvanized after fabrication. All welds shall be mechanically cleaned before Galvanizing. Galvanized materials on which the Galvanizing has been damaged in transporting, handling, or erection will be rejected or may, with the approval of the Engineer, be repaired in the field by the zinc alloy stick method. Required field welds and adjacent areas on which the Galvanizing has been damaged shall be galvanized by this same method. The zinc alloy stick shall be cast from zinc, tin, and lead in combination with fluxing ingredients. The compound shall be completely liquid at a temperature not lower than two hundred and forty six (246) degrees C. The area to be re-galvanized shall be thoroughly cleaned, including the removal of slag on welds. The surface shall be heated with an oxyacetylene torch to approximately three hundred and fifteen (315) degrees C, and the alloy stick rubbed over the surface to fix a deposit. While the alloy is still liquid, a clean wire brush shall be used to smooth the deposit evenly over the entire area being re-galvanized. If a heavy deposit or build-up is required to match the original coating, more alloys shall be added immediately to the initial bond deposit and spread with a paddle or brush until the required thickness is obtained. Edges of drilled holes shall be coated with commercially available zinc-rich paint. Shop drawings will not be required for pipe posts.

The Contractor shall furnish to the Engineer, fabricators' certifications in triplicate certifying that the material supplied conforms to all of the requirements specified.

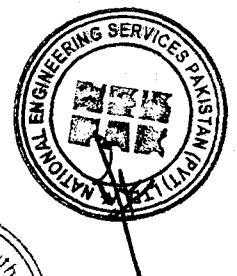
#### 614.2.12 Fastening Signs to Sign Posts

Signs shall be fastened to sign supports in accordance with the requirements of the drawings, the recommendations of the sign manufacturer and to the satisfaction of the Engineer.

After installation of signs on their supports all bolt heads, screw heads, and washers which are exposed on the face of the sign shall be painted. The color of the paint used shall be as nearly as practical the same as the color of the background or message area at the point where the bolt, screw, or washer is exposed.

Where steel signs are mounted with aluminum hardware or on steel posts, approved asphalt, nylon, or neoprene insulation shall be installed at all points where dissimilar metals might come in contact.

#### 614.3 Erection of Delineators and Marker Posts



Delineators shall be erected at locations shown on the drawings and set at elevations such that the Delineator reflectors will be at the indicated height above the ground surfaces. Unless otherwise noted in the Drawings or authorized by the Engineer's Representative, holes for posts shall be of the depth and size shown on the Drawings. Posts shall be set plumb and will be set to lines and grades as specified on the drawings. The cost of all excavation and concrete will be considered subsidiary to the bid item (s) for Delineators. Chevron shall also be installed on same pattern except using high density sheet for good reflection.

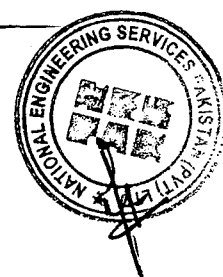
When noted on the Drawings or authorized by the Engineer's Representative, the posts shall be erected by driving, either by hand or with approved mechanical devices. The method of driving shall not substantially alter the cross-sectional dimensions of the posts or materially damage the coating. Battered tops will not be permitted. Posts which, in the opinion of the Engineer's Representative, are bent or otherwise damaged during or after erection shall be removed from the site and replaced at the Contractor's expense. After driving, the portion of the posts above ground shall be plumb and the posts shall be firm in the ground.

Reflectors shall be attached to the posts as indicated on the drawings or as directed by the Engineer or according to the manufacturer's specifications.

614.4

**PAYMENT**

Pay Item No.	Description	Unit of Measurement
SP-614	Delineators / Angle Reflector	Each



SP-615

**GANTRY SIGNS**



**615.1****GENERAL**

The work shall consist of supply, fabrication and installation of gantry signs at locations as shown on drawings or as directed by the Engineer as per the site requirement, complete in all respect. Gantry signs shall be required to be installed to provide the information about the important places and restriction enforced for type of passing vehicles.

The gantry signs shall be manufactured and installed in accordance with the details shown in the gantry sign's drawings and as directed and approved by the Engineer's representative. The sign panel shall be designed suiting the situation and approved by the Engineer's representative before its manufacture.

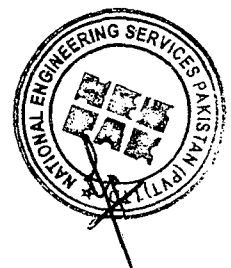
**Gantry Sign Structure**

The contractor shall be responsible to submit the complete methodology and shop drawings prior to the start of any activity and get approved from the Engineer representative. All work in respect of the furnishing, construction of foundation and erection and finishing of gantry sign structure shall conform to the drawings and to the relevant requirements of General Specifications section 401 "Concrete", section 404 "Steel Reinforcement" ,section 413 "Steel Structures and section 607 "traffic signs and safety devices" with amendments made in SP-504.

**615.2****MEASUREMENT AND PAYMENT**

The item shall be paid for as under, which price and payment shall be full compensation for all the costs necessary for the proper manufacture, installation and completion of work prescribed in the item/drawing:

Payment Item No.	Description	Unit of Measurement
SP-615a	Gantry Sign Type-I as shown on drawing	Each
SP-615b	Gantry Sign Type-II as shown on drawing	Each



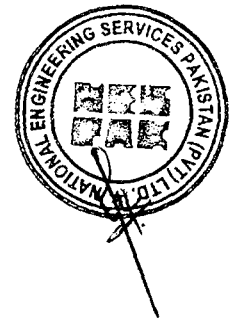
**415.1****SONIC INTEGRITY TESTS (SIT)**

All working piles shall be subjected to Sonic Integrity Testing (SIT) by a specialist agency engaged by the Contractor. The SIT equipment like FPDS (Foundation Pile Diagnostic System) or equivalent, as approved by the Engineer, shall be used for this purpose. The testing shall be done as per ASTM D5882-07. Before starting this testing, the Contractor shall submit his Method statement for approval of the Engineer.

The contractor shall arrange performance and interpretation of these tests by the specialist agency like TNO Netherlands or equivalent. The interpretation shall include information on pile length, concrete crushing strength, Sonic Pulse Velocity and defects like necking / honeycombing etc. A separate report shall be submitted for SIT carried out on piles by the Contractor.

**415.2****PAYMENT**

Item No.	Description	Unit of Measurement
SP-415	Sonic Integrity Tests (SIT) on all piles	Each



**418.1 DESCRIPTION**

The Contractor shall furnish and place galvanized iron drain pipe (AASHTO Standards M 1118-80 1986) in accordance with the plan of Bridge deck, specifications and/or as ordered by the Engineer.

**418.2 MATERIALS**

The Galvanized iron pipe shall conform to the requirements of ASTM Designation A120.

**418.3 CONSTRUCTION**

Where the pipe is used for bridge drains it shall be cast in the deck and shall be flush with the deck surface.

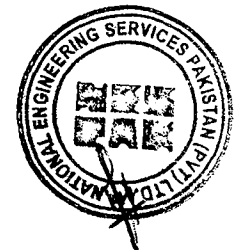
**418.4 MEASUREMENT**

The quantity to be paid for under this item will be number of linear meter of pipe incorporated in the work in accordance with the plans and specifications and as directed by the Engineer.

**418.5 PAYMENT**

The unit price bid per linear meter shall include the cost of furnishing and placement including all labor, materials and equipment necessary to complete the work.

Item No.	Description	Unit of Measurement
SP-418	GI drain pipe Dia 100 mm	M



**SP 701 PROVISIONS OF SURVEY TEAMS AND INSTRUMENTS**

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**701.1 DESCRIPTION**

The Contractor shall provide and maintain survey equipment for the sole use of the Engineer. All surveying equipment shall be new and shall be maintained throughout the Contract period and replaced by the Contractor free of charge in case of damage or loss. The survey equipment shall be supplied to the Engineer within thirty (30) calendar days from the Engineer's Order to Commence the Works.

Upon completion of the Contract, the surveying instruments and equipment shall become the property of the Employer and shall be handed over completely, and in a state of good, condition and working order taking into account fair wear and tear.

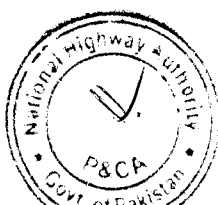
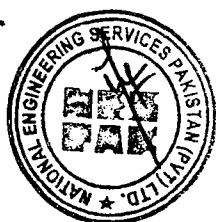
The Contractor shall provide adequate number of helpers, along with the equipment, to the Engineer/Engineer's Representative to assist in carrying out the field works.

701.2

### EXTENT OF PROVISION AND GENERAL REQUIREMENT

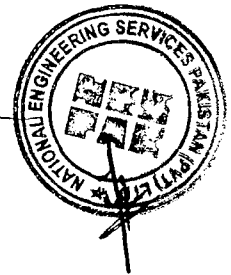
The Contractor shall provide and maintain at his own cost at least the following surveying equipment and any other surveying equipment deemed essential for the Work by the Engineer's Representative for the sole use of the Engineer's Representative:

Sr. No	Description	Quantity
1	<b>Electronic Total Station</b> 1" reading, 6" Accuracy, memory 10,000 points or more, Builtin SD Card Slot & USB Port, programs topographic survey, setting out, curve Guide Light, Keyboard, Automatic Dual Axis Compensator working range $\pm 6'$ distance range reflector less 400 meter with single prism 5000 meter, with Triple Prism 6000 meters, one Balley & Quick Charger in Standard Accessories (Made in Japan or Equivalent).	1 Nos.
2	Software for Data Downloading.	1 No.
3	Single Prism Target Set includes: Prism, range pole graduated 2.6m., tilting mount with Coaxial Target Plate.	4 Nos.
4	Automatic Level, magnification 32X	2 Nos.
5	Levelling Staves with graduations in metric units	12 Nos.
6	Steel measuring tapes 30 m long	4 Nos.
7	Lockable Pocket tapes 5 m.	4 Nos.
8	TRIPOD (Aluminum)	5 Nos.
9	TRIPOD for Prism Pole	4 Nos.
10	Club hammers 2 kg.	4 Nos.
11	Sledge hammers 4 kg.	4 Nos.



above and as directed by the Engineer's Representative:

Item No.	Description	Unit of Measurement
SP-701a	Provide Surveying and Allied Instruments.	P.S.
SP-701b	Maintain Survey Instruments, Including 2no. Helpers..	Month



**SP 702 PROVIDE EQUIP & FURNISH ENGINEER'S OFFICE & ACCOMODATION**

---

**702.1 General**

12	Traffic Cones	40 Nos.
13	Survey Umbrellas	6 Nos.
14	Aluminum Straight Edges, 4 m long	2 Nos.
15	Aluminum Straight Edges, 5 m long	2 Nos.
16	Spirit Levels, 30cm long	4 Nos.

- *All miscellaneous tools, equipment and materials required in surveying in numbers as determined by the Engineer's Representative.*

All new surveying equipment shall be provided and maintained throughout the Contract period. In case of damage or loss those shall be replaced by the Contractor at his own cost.

The Contractor shall make available two (02) qualified surveyors and transport vehicle for checking and incorporation as and when required by the Engineer's Representative.

The survey equipment shall be placed at the disposal of the Engineer's Representative during the Contract period and shall be returned to the Employer on completion of the Contract, complete and in a good state, taking into account fair wear and tear.

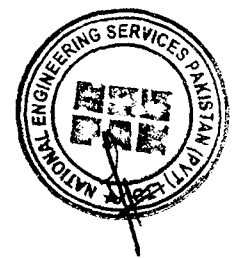
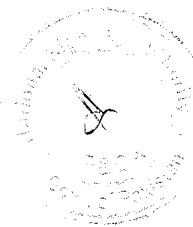
The Contractor shall provide adequate supplies of expendable materials i.e. level books, pencils, erasers inks, drawing papers, pegs, nails, flags, brushes and paints etc. as required by the Engineer's Representative.

701.3

**PAYMENT**

The cost of supplying the equipment shall be paid as re-imburement against provisional sum substantiated by vouchers from the owner plus twelve (12) percent surcharge to the contractor for administrative and overhead expenses including income tax (7.5%) related to the purchase and delivery of said items.

For running and maintenance, supporting staff, transport, stationery, utilities etc. shall be paid under maintenance of Surveyor Instrument.



Payment shall constitute full compensation for all costs of provision and maintenance of equipment, provision of vehicle, furnishing survey teams, supplies of expendable materials, necessary labor/helpers and all other incidental item(s) for the proper completion of the Work as stated herein

The contractor shall provide a site office on rental basis against provisional sum provided in the Bill of Quantities. The site office includes the following:

- i) Office accommodation
- ii) Office furnishing and equipment
- iii) Office running and maintenance
- iv) Office supporting staff

**702.2 Engineer's Representative Office / Accommodation**

The office accommodation as approved and accepted by the Engineer shall be provided on rental basis. The overall size of the Engineer office shall be approximately 1000 Square. meters and residence accommodation of about 2,000 Square. meters having all kind of facilities.

**702.3 Furnishing & Equipment**

The furniture and equipment as approved and accepted by the Engineer shall be provided by the Contractor on the instructions of the Engineer or Representative of Engineer as per the requirement.

**702.4 Running and Maintenance**

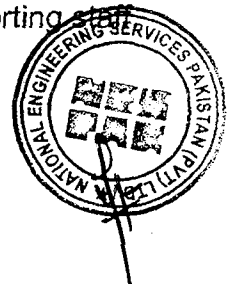
702.4.1 The contractor shall be responsible for the running and maintenance of office accommodation, residence accommodation, furnishing and equipment etc. bills for all services/utilities to be paid by the contractor.

702.4.2 Office and Drawing Stationery and necessary equipment shall be provided by the contractor on monthly requirement basis as per the requirement or as directed by the Engineer.

**702.5 Supporting Staff**

The contractor shall provide to the Engineer following supporting staff

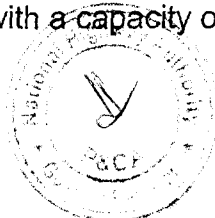
- |      |            |                   |
|------|------------|-------------------|
| i)   | Naib Qasid | Two               |
| ii)  | Chowkidar  | Two               |
| iii) | Cook       | Two and helper 02 |
| iv)  | Sweeper    | Two               |
| v)   | Guards     | Two               |



The appointment of the supporting staff shall be subject to the approval of the Engineer and once assigned shall not be transferred or laid off without prior approval of the Engineer.

In case of power failure and non-availability of power, electric power through generators shall also be provided by the contractor. All rooms shall be provided with standard office lighting of the flours cent type. All rooms shall have doors with locks and keys and supplied Air-conditioning and heating system as per the approval of the Engineer.

The water supply shall be maintained through water supply system of the town or locality boring/installing well with pump or by an elevated or pressure storage tank with a capacity of 2500 gallons.



A telephone shall be installed in Engineer's Office or cell phone may also be provided to facilitate the Engineer. Engineer office will be equipped with air-conditioning unit as per requirement.

702.6

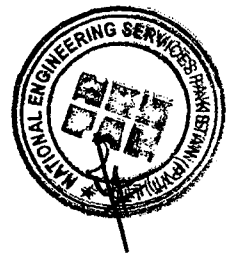
**Measurement and Payment**

For the hiring of accommodation for site office if approved & allowed by the Engineer, the cost of rent and supplying office furniture and Equipment shall be paid as re-imburement against provisional sum substantiated by vouchers from the owner plus twelve (12) percent surcharge to the contractor for administrative and overhead expenses including income tax (7.5%) related to the purchase and delivery of said items.

For running and maintenance, office supporting staff, drawings, stationery, utilities bills etc. shall be paid under maintain of Engineer's office.

If the contractor does not provide necessary facility, Engineer shall hire the accommodation and arrange necessary supplies of furniture and equipment and employ staff etc. as specified and maintain the office. Expenditures shall be recovered from the IPC's / running bills of the contractor by adding hundred (100) percent overheads.

Pay Item No.	Description	Unit of Measurement
SP-702 a	Provide the Employer's and Engineer's Representative's Office and Residence (on rental basis)	Provisional Sum
SP-702 b	Furnish and Equip. the Employer's & Engineer's Representative Office and Residence	Provisional Sum
SP-702 c	Maintain Employer's and Engineer's Representative Office and Residence	Month



SP 703

**PROVIDE, EQUIP AND MAINTAIN LABORATORY FOR THE PROJECT**

703.1

**Description**

The work under this special provision shall be providing of three nos material testing laboratories on rental basis having minimum 500 Sq.m



covered area of each and shall be fully equipped with all necessary furnishing & equipment, utilities, installations and others as directed by the Engineer. Locations of material testing laboratories shall be as per approval / decision of the Engineer.

703.2

### General Requirements

The furnishing of equipment shall ensure conducting all tests related to construction as per the list provided by the Engineer. In case if any test required for testing of material cannot be performed in the project laboratory, the Engineer may authorize such test to be carried out at the cost of contractor, at any other laboratory. The Contractor shall provide at no cost to the Engineer, technicians, helpers and vehicles deemed necessary by the Engineer, to assist in the operation of the laboratories as required by the Contractor's proposed program of work. Technicians and helpers once assigned to the laboratories may be removed by the Contractor only with the approval of the Engineer and salaries shall be paid by the contractor. The equipment shall be procured within 15 days on the instructions of the Engineer.

The contractor shall maintain the laboratory equipment, apparatus and supplies necessary to permit execution of all standard test required by the specifications. Lists of specific laboratory equipment shall be provided as per the requirement and recommendation to purchase from recognized manufacturers. The Contractor shall submit to the Engineer for his approval at the earliest. The list shall include the manufacturer's name and descriptive literature. Lab Equipment, fixtures and furniture shall remain the property of the Employer after completion of the project.

703.3

### Facility of the Material Testing

Material testing equipment as described above shall be provided within minimum period. In case of delay in providing such facility, as an interim arrangement, temporary facilities of testing material shall be provided as agreed by the Engineer. Contractor may be paid for maintenance of temporary laboratory, provided such facilities are acceptable to the Engineer. Contractor shall also be responsible for extra expenses of the Engineer for conduction of test in temporary arrangement.

703.3.1

#### Supporting Staff

The contractor shall provide to the Engineer below mentioned supporting staff:

- |      |            |     |
|------|------------|-----|
| i)   | Naib Qasid | One |
| ii)  | Chowkidar  | One |
| iii) | Cook       | One |
| iv)  | Sweeper    | One |

The appointment of the supporting staff shall be subject to the approval of the Engineer and once assigned shall not be transferred or laid off without the Engineer approval. Salaries shall be paid by the contractor.

703.4

### Running and Maintenance



703.4.1 The contractor shall be responsible for the running and maintenance of Laboratory, furnishing and equipment etc. bills for all services/utilities to be paid by the contractor.

703.4.2 Office and Drawing Stationery and necessary equipment & material shall be provided by the contractor on monthly requirement basis as directed by the Engineer.

**703.5 MEASUREMENT AND PAYMENT**

**703.5.1 Measurement**

Work under this item shall be measured in two portions.

- i) Hired the building for Material Testing Laboratory and purchase of laboratory equipment shall be paid as reimbursement against provisional sum substantiated by vouchers from the owner plus twelve (12) percent surcharge to the contractor for administrative, overhead expenses including income tax (7.5%) related to the purchase and delivery of said items.
- ii) For running / maintenance and office supporting staff, drawing stationery, Lab. Material/equipment (minor), utilities bills, helpers (06 nos.) etc. shall be paid under maintain base Laboratory. Maintain Laboratory, to be measured for the duration of the contract and paid as per the rate/month.

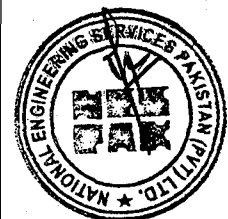
**703.6 Payment**

The quantities under this item of work shall be paid at the contract price indicated in the Bill of Quantities which price and payment shall constitute full compensation for all costs of furnishing labor, materials, equipment and incidentals for the proper completion of the work indicated in these specifications and specified on the drawings and Special Provisions (Specification).

Pay Item No.	Description	Unit of Measurement
SP- 703 a	Provide Material Testing Project Laboratory (01 No rental basis)	Provisional Sum
SP- 703 b	Equip and Furnish Material Testing Project Laboratory	Provisional Sum
SP- 703 c	Maintain Material Testing Project Laboratory 01 Nos including 04 No Helpers	Month

**SP 708 PROVIDE, RUN AND MAINTAIN TRANSPORT FOR EMPLOYER / ENGINEER'S REPRESENTATIVE**

708.1 General



The transport for the Employer's / Engineer's Representative and site staff is to be provided under this Contract for which provisional sum and rate item has been provided in the B.O.Q. Contractor shall procure these vehicles under the instruction of the Engineer.

#### **Procurement of Vehicles**

The contractor shall procure the vehicles from the local market, get these registered in the name of the Employer and hand over to the Employer's and Engineer's Representative.

Details /Type of vehicles are as under:

SP-708a : One (01) No vehicles for the Employer representatives  
(Type of vehicle will be as per the directions of Employer)

SP-708b : Five (05) Nos. vehicles for the Engineer's representatives  
(i) 4x4 Double Cabin 2800cc (1 No.)  
(ii) Car 1600 cc (02 Nos)  
(iii) MPV 800cc (02 Nos)

The number of vehicles (6 nos.) covered under this provision shall be new/ latest model at the time of delivery when instructions to procure these vehicles is given as per approval of the Engineer. The vehicles shall be handed over to Employer / Engineer's Representative. The Contractor shall be responsible for the cost of running & maintenance. These vehicles shall remain the property of the Employer and shall be handed over to the Employer after completion of the work in good working condition. The cost of vehicle shall be inclusive all like purchase, transportation, registration and other dues incurred in this regard. In case new vehicles are not purchased, same numbers of road worthy conditions vehicles shall be hired and its rent cost shall be paid through pay item SP-708a, rental cost shall be approved by the Employer.

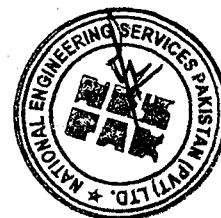
In case of delay, failure or default on the part of the Contractor in providing the facilities under these provisions, the Engineer's Representative may arrange the same at the risk and cost of the Contractor or hired the vehicles such period.

#### **708.2 Running & Maintenance**

The Contractor shall be responsible for the running and maintenance of these vehicles which includes petrol, diesel, repair works, regular tuning, replacement of tires, registration, comprehensive insurance, annual renewal, lubricants, servicing including providing drivers etc.

#### **708.3 Method of Payment**

On the instructions and determination by the Engineer, Contractor shall be paid for the Services under this Clause as follows:-



- i) For the procurement of vehicles Contractor shall provide the original supporting vouchers/receipts for his billing which shall be paid from the provisional sum with 10% extra cost as handling charges and income tax. In addition to that contractor shall also be paid applicable levies & other taxes but not the income tax (7.5 %) (If applicable).
- ii) For running and maintenance of above vehicles including salaries of drivers, the Contractor shall be paid on monthly basis.
- iii) On failure of the contractor to provide and of the services under this clause or even otherwise notwithstanding anything contained in any other clauses of the Contract Documents, the "Engineer" shall have the authority to nominate/sublet to any other contracting agency on recommendation of the Resident Engineer for the supply of services under this clause, the payment for which shall be made through this contract direct to the nominated agency out of Provisional Sum provided in the Contract or hire the good road worthy vehicles and recover the cost with 100% penalty charges from contractor's IPC's.

Item No.	Description	Unit of Measurement
SP-708a	Provide Employer's Representative Transport (01 Nos.)	PS
SP-708b	Provide Engineer's Representative Transport	
	(i) 4x4 Double Cabin 2800cc (1 No.)	Each
	(ii) Car 1600 cc (02 Nos)	Each
	(iii) MPV 800cc (02 Nos)	Each
SP-708c	Running & Maintenance of Employer's/Engineer's Representative Transport	Vehicle-Month



SP-715

**EMPLOYING TRAINEE ENGINEER'S WITH BOARDING, LODGING AND MESSING**

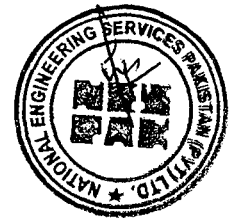
The contractor will employ Trainee Engineers after the approval of the Employer, throughout the duration as per the contract and BOQ. Each

Trainee Engineer will be given a monthly stipend Rs. 50,000 (minimum) by the contractor. The period of training of each trainee will be as per the contract. The Contractor will prepare a comprehensive training program and get it approved from NHA. It will be the contractor's responsibility for the provision of boarding & lodging of each Trainee Engineer or paid separately its cost.

**Measurement and Payment**

The number of Trainee Engineers shall be counted and paid to contractor as per the contract unit price which includes full compensation for all costs necessary like monthly stipend, boarding, lodging and transport facility.

Item No.	Description	Unit of Measurement
SP-715	Employing Trainee Engineer's With Boarding, Lodging And Messing	Man-Month



# **Environmental, Health and Safety Management Requirement**

**EHSMP is attached to the Bidding Document.**



## 8 Environmental Management and Monitoring Plan

### 8.1 Environmental Management Plan

As evident from Chapter 6 the proposed project does not have any major adverse environmental and social impacts on project area. Some minor to moderate adverse impacts identified pertains to construction phase only which include emission from construction machinery, dust pollution and safety and social issues. All these issues can be easily managed by adopting proper management techniques and by involving local communities in the implementation of the project. Table-8.1 shows the Environmental Management Plan (EMP) to be taken in order to decrease the environmental and social impacts associated with the project.

### 8.2 Environmental Monitoring

Environmental and social monitoring is an essential tool for testing whether the adopted EMP is meeting the set objectives. The specific objectives of the monitoring plan are:

- To check whether mitigation measures being taken are adequate and effective,
- To comply with legal obligations including safety on construction sites, and
- To provide means where impacts which were uncertain at the time of preparation of EMMP or unforeseen could be identified and steps are required as corrective measures.

To check whether suggested mitigation measures have been adopted, the monitoring indicators and frequency of monitoring along with the parties responsible for implementation and supervisions are also mentioned in the table below.

### 8.3 Compliance Monitoring

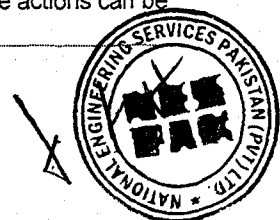
Compliance monitoring is done to check whether the actions proposed in EMP have been carried out. The tools used for this purpose are visual observations, official record, photographic documentation and the use of checklists. Compliance monitoring shall be done by the Environmental and social staff of Construction Supervision Consultants (CSC) and counter checked by environmental and social staff of NHA. The frequency and parameters to be monitored are given in table below. The instrumental monitoring required during the project execution is drinking water quality test and ambient air quality to make sure that parameters meet the National Environmental Quality Standards (NEQS) (Annexure V). For compliance monitoring the duties of environmental and social team of NHA (EST-NHA) and Environmental and Social Team of Construction Supervision Consultants (EST-CSC) are presented in Section 8.5 "Organizational Responsibilities";

### 8.4 Effects Monitoring

The EIA predicts the impacts of the proposed project on the basis of information available on the environment and the natural processes that link various environmental parameters. Based on this prediction, mitigation measures are proposed such that the predicted residual effects do not exceed beyond acceptable levels. However, there is always an element of uncertainty in such predictions due to an insufficient grasp of the processes, limitations in prediction techniques, or inadequate data on the environment.

In order to address the above concerns, effects monitoring will be undertaken during the project activities, with the overall objective of proper management of environmental risks and uncertainties. Broadly, effects monitoring has four objectives:

- To verify that the impacts of the proposed project are within acceptable limits, thus establishing credibility (public assurance);
- To immediately warn the project proponents and the regulatory agencies, (if required) of unanticipated adverse impact or sudden changes in impact trends so that corrective actions can be

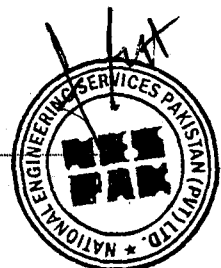


undertaken, which may include modifications in the proposed activities, or the inclusion of modified or additional mitigation measures;

- To provide information to plan and control the timing, location, and level of certain project activities so that the effects are minimized; and
- To facilitate research and development by documenting the effects of the proposed project that can be used to validate impact-prediction techniques and provide a basis for more accurate predictions of future impact

The effects monitoring will mainly comprise the following:

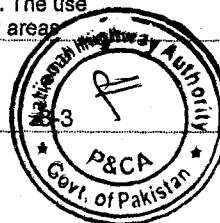
- Soil erosion;
- Air quality (Gases, dust and particulate matter);
- Noise;
- Socioeconomic and cultural aspects; and
- Surface and ground water quality.



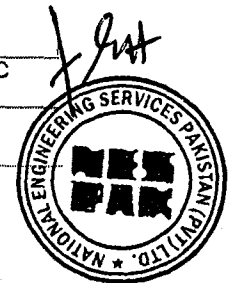
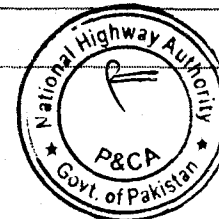


**Table-8.1: Environmental Management and Monitoring Plan (EMMP)**

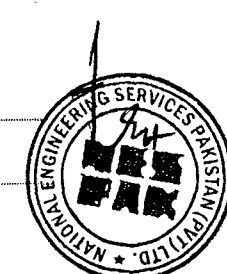
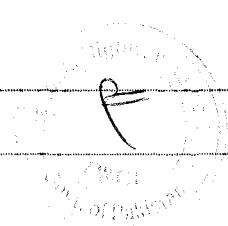
Sr.#	Issue	Mitigation Measure	Monitoring Indicator	Monitoring Frequency	Parties Responsible Implementation	Supervision
<b>Design Phase</b>						
1)	Landscape visual impact	Design of infrastructure that conforms with the site features (topography and aesthetics)	- Site infrastructure design matching the local environment.	Once	Design Consultants	NHA
2)	Soil and water contamination	Design appropriate containments for oils/other construction chemicals and sanitary waste from the contractor's camp and other places.	- Inclusion of sanitary facility and paved containments in the design.	Once	Design Consultants	NHA
3)	Removal of Vegetation and cutting of trees	Design of appropriate construction that provides for incorporation of minimum removal of vegetation and existing trees.	- Site infrastructure incorporating existing trees.	Once	Design Consultants	NHA
<b>Pre-Construction Phase</b>						
1)	Approval/ NOCs from relevant EPA/ Authorities	- Canal Bridges/ culverts design shall be shared with relevant department/s for approval. - Building design shall also be shared with relevant department/s for approval.	- NOC obtained from all relevant departments.	Once	NHA	NHA
2)	Displacement of Persons along the road corridor	Preparation and Implementation of Resettlement Plan (RP) - Preparation and Implementation of a Resettlement Plan - Compensation of PAPs - Payment to PAPs for shifting - Relocation of PAPs to New Site	- Compensation paid to all PAPs.	Once	NHA	NHA
3)	Lack of support from project area community.	- Timely dissemination of project facts to community and stakeholders through public consultation and designated meetings. - Convening of meetings with Community and Stakeholders to carry out sensitization and disseminate project facts.	- Feedback information from project area community.	Weekly before start of construction	Contractor	CSC
4)	Vegetation damage	- Except to the extent necessary for establishing the construction site and carrying out the construction works, vegetation shall not be removed, damaged or disturbed nor should any unauthorized planting of vegetation take place; - The clearance of the site for construction purposes shall be kept to a minimum. The use of existing un-vegetated or disturbed areas	- Existing trees incorporated in the Road Design.	Periodically	Contractor	CSC



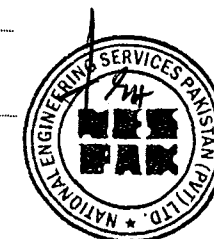
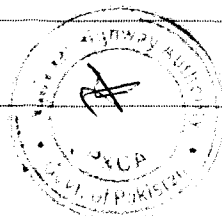
Sr.#	Issue	Mitigation Measure	Monitoring Indicator	Parties Responsible		
				Monitoring Frequency	Implementation	Supervision
		for the Contractor's Camp, stockpiling of materials etc. shall be encouraged; - Areas to be cleared should be agreed with experts and demarcated before the start of the clearing operations; - Clearing and removal of vegetation, especially at borrow sites must be carried out in such a way that damage to adjacent areas is prevented or minimized; - All vegetation encroaching into the road reserve must be cleared to give room for visibility; - Areas with dense indigenous vegetation are not to be disturbed unless required for construction purposes, nor shall new access routes be cut through such areas; - Trees should be trimmed rather than removed wherever possible; and - Inventory of trees to be cut during construction.				
<b>Construction Phase</b>						
1)	Environmental and social issues while siting and operating camp sites	- Contractor need obtain clearance permit for siting work camp and workshop for acceptability from public/owner interferences; - All efforts during the design stage should be made to minimize the removal of existing plantation at camp site; - Contractor will provide plan for siting & rehabilitation of camp site upon completion; - Photographical and botanical inventory of vegetation before clearing the site - Compensatory plantation to be scheduled when construction work near to end; for each tree removed 10 new plants shall be planted; - The Contractor will provide a proper waste management plan (Annexure IX); and - The sewerage system for the camp will be properly designed (pit latrines) and built so that no water pollution takes place.	- Record of tree cutting and compensatory plantation - Compliance as per mitigation measures proposed.	Periodically	Contractor	CSC
2)	Generation of used oils and other hazardous substances	- All maintenance of equipment and vehicles shall be performed in the workshop.	- Quarry and borrow pit site reports	Periodically	Contractor	CSC



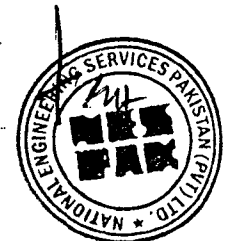
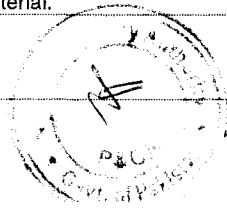
Sr.	Issue	Mitigation Measure	Monitoring Indicator	Monitoring Frequency	Parties Responsible Implementation	Supervision
		<ul style="list-style-type: none"> <li>- If it is necessary to do maintenance on site, but outside of the workshop area, the Contractor shall obtain the approval from CSC prior to commencing activities;</li> <li>- The Contractor shall ensure that there is no contamination of the soil, vegetation or surface water.</li> <li>- The workshop shall be kept tidy at all times and shall have the following as a minimum:                             <ul style="list-style-type: none"> <li>- An impermeable floor either constructed of concrete or suitable plastic fabric</li> <li>- The floor shall be bunded and sloped towards an oil trap or sump.</li> </ul> </li> <li>- Drip trays shall be used to collect the waste oil and lubricants.</li> <li>- The drip trays shall be inspected and emptied daily;</li> <li>- Drip trays shall be closely monitored during wet weather</li> </ul>				
3)	Environmental and social concerns during excavation and rehabilitation of borrow pits.	<ul style="list-style-type: none"> <li>- The Contractor must obtain any necessary permits for borrow pits from the competent authorities, including National Highway Authority.</li> <li>- No excavations are allowed within 100 m to ROW.</li> <li>- In borrow pits the depth of the pit will be regulated so that the sides of the excavation will have a slope not steeper than 1: 4.</li> <li>- Soil erosion along the borrow pit shall be regularly checked to prevent / mitigate impacts on adjacent lands.</li> <li>- In case burrowed pits fill with water, measures shall be taken to prevent the creation of mosquito-breeding sites.</li> <li>- Abandoning borrow areas without proper rehabilitation measures will be disallowed.</li> <li>- The Contractor's agreement with the landowner must determine the options and appropriate measures for rehabilitation of the borrow pit as approved by the Independent Consultant, such as reshaping the borrow site</li> </ul>	<ul style="list-style-type: none"> <li>- Permits obtained for borrow pits from the competent authorities.</li> <li>- Compliance as per mitigation measures proposed.</li> </ul>	Periodically	Contractor	CSC



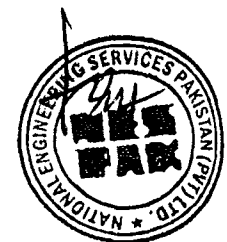
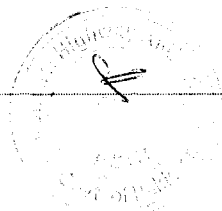
Sr.#	Issue	Mitigation Measure	Monitoring Indicator	Monitoring Frequency	Parties Responsible	
					Implementation	Supervision
4)	Soil Erosion and Contamination	<p>into a desired land-use plot (e.g. irrigation field, fishpond), re-plantation aiming at double amount of trees removed from the site.</p> <ul style="list-style-type: none"> <li>- Soil from the site is to be used for backfilling excavated areas while excess soil is disposed of off-site;</li> <li>- Soils are not to be left exposed to wind/rain;</li> <li>- Soil erosion is to be reduced and river valley protection enhanced.</li> <li>- Unnecessary clearing of vegetation will be strictly prohibited.</li> <li>- Vehicle speeds will be regulated and monitored to avoid excessive dust emissions.</li> <li>- Incident record of all moderate and major spills will be maintained. The record will include the location of spill; estimated quantity; spill material; restoration measures; photographs; description of any damage to vegetation, water resource, and corrective measures taken.</li> <li>- Fuel tanks will be daily checked for leaks and all such leaked will be plugged immediately.</li> <li>- A Management plan (Annexure IX) will be prepared to deal with spills.</li> </ul>	<ul style="list-style-type: none"> <li>- Ground cover in constructed areas</li> <li>- Quality of surface water at the site and in the neighbouring rivers/canals</li> <li>- Take photographs before and after construction activity to monitor any change and soil conditions</li> <li>- Daily checking of fuel tanks for leakages</li> <li>- Development of Management plan and its implementation</li> </ul>	Weekly	Contractor	CSC
5)	Air Pollution (dust, fuel and smoke emissions)	<ul style="list-style-type: none"> <li>- Control speed of construction vehicles and Prohibit idling of vehicles;</li> <li>- Water is to be sprayed during the construction phase on dusty areas to reduce dust emission;</li> <li>- Regular maintenance of vehicle &amp; equipment to reduce smoke;</li> <li>- Provision of dust masks for use in dusty conditions;</li> <li>- Use of serviceable vehicles/machinery to avoid excessive smoke;</li> </ul>	<ul style="list-style-type: none"> <li>- Records of machine and vehicle maintenance</li> <li>- Water spraying on dust pollution sources</li> <li>- Availability and use of protective gear</li> <li>- Installation of proper signage</li> </ul>	Weekly	Contractor	CSC
6)	Excess noise and Vibration	<ul style="list-style-type: none"> <li>- Use of noise reduction/ hearing protection devices when working with noisy equipment or noisy environment;</li> <li>- Use serviceable equipment with low noise emission;</li> </ul>	<ul style="list-style-type: none"> <li>- Records of machine and vehicle maintenance</li> <li>- Availability and use of Ear Muffs</li> </ul>	Weekly	Contractor	CSC



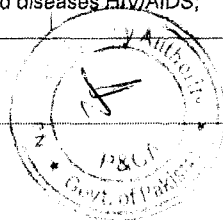
Sr.#	Issue	Mitigation Measure	Monitoring Indicator	Monitoring Frequency	Parties Responsible Implementation	Supervision
7)	Dust generation due to erection of bating & asphalt plant causing health risks to operating workers, impact on biophysical environment	<ul style="list-style-type: none"> <li>- Instruct truck/machinery operators to avoid raving engines;</li> <li>- Ensure precautions to reduce the level of dust emissions from, hot mix plants, crushers and batching plants will be taken up, e.g. providing them, as applicable, with protection canvasses and dust extraction units.</li> <li>- Mixing equipment will be well sealed and equipped as per existing standards.</li> <li>- Water will be sprayed on the lime/cement and earth mixing sites.</li> <li>- Work safety measures like dust masks shall be provided by the contractor to ensure no health risks for operators.</li> </ul>	<ul style="list-style-type: none"> <li>- Compliance as per mitigation measures proposed.</li> </ul>	Periodically	Contractor	CSC
8)	Generation of Solid Waste	<ul style="list-style-type: none"> <li>- A Waste Management Plan (Annexure IX) will be developed before the start of the construction.</li> <li>- Provide communal solid waste collection containers (skip) for the collection and storage prior to appropriate disposal;</li> <li>- Segregation of solid waste;</li> <li>- Recyclables should be sold to local contractor;</li> <li>- Excavation activities to be done preferably during the dry season to avoid soil erosion and siltation of streams;</li> <li>- All non-hazardous waste material that cannot be recycled or reused will be disposed of as per waste management plan.</li> <li>- Construction site soil to be used to backfill excavated sites;</li> <li>- All containers of hazardous waste will be appropriate labelled.</li> </ul>	<ul style="list-style-type: none"> <li>- Preparation and implementation of Waste Management Plan</li> <li>- Clean, Organized, Neat Road Site</li> <li>- Presence of waste collection receptacles</li> <li>- Periddic instrumental monitoring</li> </ul>	Weekly	Contractor	CSC
9)	Generation of Liquid Waste – used oil and other Chemicals (Hazardous Waste)	<ul style="list-style-type: none"> <li>- Construct a paved containment for storage of oils and other liquid chemicals being used in the construction of the road;</li> <li>- Provide containers for storage of used oils from vehicles /machines/equipment being used at the construction site;</li> <li>- Engage a Registered Firm for the collection of hazardous material.</li> </ul>	<ul style="list-style-type: none"> <li>- Presence of a paved area for storage of oils and other chemicals</li> <li>- Presence of used oil containers.</li> <li>- Presence of proper disposal arrangements</li> </ul>	Weekly	Contractor	CSC



Sr.#	Issue	Mitigation Measure	Monitoring Indicator	Monitoring Frequency	Parties Responsible Implementation	Supervision
10)	Impacts on Physical Cultural Resources	If cultural heritage (e.g. graves, cemeteries, sacred trees, etc.) are discovered the contractor must stop work and contact NHA. NHA will then contact Archaeological department for further investigation. The Contractor also must use the Chance Finds Procedures provided in Section 8.5.4.	- Records of locations of ancient objects and cultural heritage	As needed	Contractor	CSC
11)	Risk of fire	<ul style="list-style-type: none"> <li>- Provide firefighting equipment at the construction site area;</li> <li>- Contractor staff to be sensitized on firefighting equipment use;</li> <li>- No burning of materials is to be permitted at the site.</li> </ul>	<ul style="list-style-type: none"> <li>- Presence of proper Fire Extinguishers and other such material at construction site</li> <li>- Awareness of workers on use of firefighting equipment's.</li> </ul>	Monthly	Contractor	CSC
12)	Pollution of Surface and Groundwater	<ul style="list-style-type: none"> <li>- No domestic waste is to be disposed of at the project area;</li> <li>- Provision of used oil containers at a central point;</li> <li>- Use of waste bins/proper waste management;</li> <li>- Pave parking area for trucks and direct drainage to containment;</li> <li>- Proper treatment of used water before disposal</li> </ul>	<ul style="list-style-type: none"> <li>- Water Quality testing results</li> <li>- Presence of Waste Bins</li> <li>- Proper used water disposal arrangements in place</li> </ul>	Monthly	Contractor	CSC
13)	Safety of Workers and other visitors at construction site	<ul style="list-style-type: none"> <li>- Use of construction site barrier tapes to isolate the site(working) area to bar intruders from accessing the area;</li> <li>- Layout plan for camp site, to be approved indicating safety measures taken by the contractor, e.g. firefighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents;</li> <li>- Use of appropriate Personal Protective Equipment (PPE) during the clearing of vegetation and construction activities;</li> <li>- Adopting ergonomic work flow designs that fit physical tasks to employees and not vice versa. Maintain work productivity;</li> <li>- Construction site visitors require appropriate safety Gear and guidance.</li> </ul>	<ul style="list-style-type: none"> <li>- Workers have and are using Safety Gear</li> <li>- Medical records</li> <li>- Emergency contacts for nearest Emergency services, Hospital and Police available</li> <li>- One permanent dedicated ambulance with all necessary equipment ready at times</li> <li>- Presence of one MBBS doctor and First aid staff</li> <li>- Preparation and implementation of EPRP</li> </ul>	Weekly	Contractor	CSC



Sr.#	Issue	Mitigation Measure	Monitoring Indicator	Monitoring Frequency	Parties Responsible	
					Implementation	Supervision
		<ul style="list-style-type: none"> <li>- One permanent dedicated ambulance with all necessary equipment ready at times at each working site or at suitable distance.</li> <li>- Presence of certified First aiders</li> <li>- Presence of one qualified MBBS doctor with ambulance.</li> <li>- Display of emergency contact Nos. At suitable place</li> <li>- The Contractor will develop an EPRP in collaboration with the Engineer to establish actions and contacts in case of emergency.</li> </ul>				
14)	Temporary road use risk to local population	<ul style="list-style-type: none"> <li>- Notification on the intension to move large equipment by road;</li> <li>- Observe strict code of conduct by the transporters;</li> <li>- The contractor shall develop "Traffic Management Plan" (TMP) (Annexure IX) and health and safety policy and procedures, and educate all drivers and workers;</li> <li>- Access roads for haulage trucks, used during road construction, should not be located near schools, hospitals and residential areas;</li> <li>- Trespassing from construction sites shall be restricted.</li> </ul>	<ul style="list-style-type: none"> <li>- Availability and announcing of transportation Programme well in advance.</li> <li>- Preparation and implementation of Traffic Management Plan (TMP)</li> </ul>	Monthly	Contractor	CSC
15)	Working at heights	<ul style="list-style-type: none"> <li>- Testing of structures for integrity prior to undertaking work;</li> <li>- Implementation of fall protection including induction on climbing techniques and use of fall protection measures,</li> <li>- Use of harnesses and scaffolds for working at heights; Inspection, maintenance, and replacement of fall protection equipment ;</li> <li>- Use of helmets and other PPE that are going to mitigate against scratches, bruises; lacerations and head injuries due to dropping objects;</li> <li>- Provision of first aid facilities at the site;</li> </ul>	<ul style="list-style-type: none"> <li>- Medical Records and Training records</li> <li>- Availability and use of proper PPE</li> <li>- Availability of Fall Protection Equipment at the Construction Site</li> </ul>	Monthly	Contractor	CSC
16)	Health issues of construction workers and Community	<ul style="list-style-type: none"> <li>- Sensitise workers and community on sexually transmitted diseases HIV/AIDS;</li> </ul>	<ul style="list-style-type: none"> <li>- Pamphlets on Health Matters</li> <li>- Periodic awareness training record</li> </ul>	Monthly	Contractor	CSC

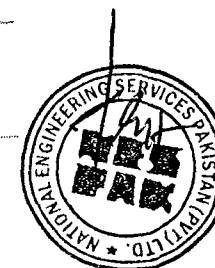


Sr. #	Issue	Mitigation Measure	Monitoring Indicator	Monitoring Frequency	Parties Responsible Implementation	Supervision
		<ul style="list-style-type: none"> <li>- Sensitize workers on use of protection facilities like mosquitoes nets or appropriate gear;</li> <li>- Health and Safety Plan (Annexure IX) will be developed and implemented to prevent and reduce accidents and occupational diseases among workers.</li> </ul>	<ul style="list-style-type: none"> <li>- Records of disease incidences/prevalence</li> <li>- Preparation and implementation of Health and Safety Plan</li> </ul>			
17)	Community misconceptions	<ul style="list-style-type: none"> <li>- Awareness and creation of better liaison with the Community on construction sites;</li> <li>- Periodic meetings with local communities to promptly;</li> <li>- Project progress reports and monitoring reports to be prepared and recommendations implemented;</li> </ul>	<ul style="list-style-type: none"> <li>- Records of Meetings with Community</li> <li>- Records of community issues recorded and responses.</li> <li>- Record of complaints received from the communities</li> </ul>	Monthly	Contractor	CSC
18)	Social Security Concerns	<ul style="list-style-type: none"> <li>- Conduct Information Education and Communication amongst the community and the project staff;</li> <li>- Hold meetings between Contractor Staff and Community;</li> <li>- Have regular police patrols at the beginning of project development;</li> <li>- Collect information on persons coming into the project area.</li> </ul>	<ul style="list-style-type: none"> <li>- Meeting reports</li> <li>- Police records on project area security</li> </ul>	Periodically	Contractor	CSC
19)	Surface run off & sedimentation from construction activities	<ul style="list-style-type: none"> <li>- Construction of effective drainages and culverts;</li> <li>- Plant soil binding grasses and other native plants</li> <li>- Covering of loose material</li> </ul>	<ul style="list-style-type: none"> <li>- Surface runoff water impact protection facilities in the project area</li> </ul>	Monthly	Contractor	CSC
20)	Sanitary facilities for construction workers	<ul style="list-style-type: none"> <li>- Installation of appropriate sanitary facilities;</li> <li>- Installation of appropriate sewage works (septic tanks and soak pits since the construction sites are not expected to have sewage network;</li> <li>- Having a monitoring programme for the septic tanks to ensure no overflow takes place</li> <li>- Proper disposal of septic tank effluent</li> </ul>	<ul style="list-style-type: none"> <li>- Presence of Toilet Facilities for Workers and Visitors at Construction Site</li> </ul>	Monthly	Contractor	CSC
21)	Stress on local water resources	<ul style="list-style-type: none"> <li>- Suitable arrangement for abstraction of water without affecting community resources</li> <li>- Carry out hydro-geological studies to identify suitable location of tube-wells</li> </ul>	<ul style="list-style-type: none"> <li>- Presence of contractor own source of water for Road construction activities without affecting community resources</li> </ul>	Periodically	Contractor	CSC





Sr.	Issue	Mitigation Measure	Monitoring Indicator	Monitoring Frequency	Parties Responsible Implementation	Supervision
		- Consider installation of independent tube-well or fetching of water sinking of borehole to provide water for construction	- Record of site complaint register			
22)	Safety of pedestrians crossing the 4-Lane Highway	- Sensitise workers and community on road safety;	- Availability of sensitization/safety awareness Report	Periodically	Contractor	CSC
23)	Dangers of Child Labour	- Contractor to be strictly advised not to engage any underage persons (under 18 years of age) to perform any form of work during construction. - Contractor will be required to comply with the Child Labour Act.	- Workers employment record or list containing date of birth.	Periodically	Contractor	CSC
24)	Site Restoration and rehabilitation.	- The sites disturbed as a result of the construction activities of the project will be restored and rehabilitated as detailed in Annex IX - E.	- ROW vegetated, Borrow areas restored, Damaged structures in haulage routes repaired.	Monthly	Contractor	CSC
<b>Operation Phase</b>						
1)	Maintenance of the Road and Working at heights	- Use of barrier tapes to isolate the maintenance areas; - Provide harnesses and scaffolds for working at heights; - Inspect, maintain and replace fall protection equipment; - Use of helmets and other PPE to mitigate against scratches, bruises; lacerations and head injuries due to dropping objects; - Provision of first aid facilities at the site;	- Use of Proper PPE and Equipment - Hand-outs on safety	Periodically	Contractor	NHA
2)	Generation of Liquid Waste from facilities (contractor's camp, fuel stations and rest areas)	- The waste water generated from the facilities will be treated through 3 chambers septic tanks. The waste water from the septic tank will be disposed off into nearby drainage system, if available, otherwise it will be stored into lined sumps from where it will be pumped out in tanker and used for irrigating plantation along the ROW.	- Waste water collected and used for irrigation purpose	Monthly	NHA	CSC
3)	Road Accidents	- Provision of First aid facilities and ambulance at proper places	- Availability of First aid and ambulance facilities at proper places	Periodically	NHA	NHA



## 8.5 Organisational Responsibilities

### 8.5.1 Inclusion of the EMP in Contract Documents

In order to make Contractors fully aware and responsible of the implications of the EMP and to ensure compliance, it is recommended that E&S measures be treated separately in the tender documentation and that payment milestones should be linked to E&S performance of contractor, measured after execution of the prescribed mitigation measures. Such a procedure would help ensure adequate management of Project impacts is carried out during the construction and operation phases, where a consistent approach will be expected on behalf of the Contractor and sub-contractors so that data and information collected from monitoring programs is comparable with baseline monitoring data.

The Contractor shall be made accountable through contract documents and/or other agreements for fulfilling E&S obligations and delivering on the E&S components of the Project. Contractors shall be prepared to co-operate with the executing agency, supervising consultants and local population for the mitigation of adverse impacts. After the EMP's inclusion in the contract documents, the Contractor will be bound to implement the EMP and will hire appropriately trained E&S management staff to ensure the implementation and effectiveness of the mitigation measures. The Contractor is required to bid for executing the EMP including the recommended mitigation measures and monitoring programs, as part of its Bill of Quantities (BOQ).

### 8.5.2 Implementation Responsibility

Ultimately, it is the responsibility of NHA as the Project Proponent to ensure implementation of the EMP through consultants and contractor(s). The Project Proponent's staff, the Construction Supervision consultants (CSC) and the Contractor will be responsible for ensuring the implementation of the EMMP and each party shall be required to have the capability and capacity to manage E&S obligations. Training and workshops shall be arranged involving the Project Proponent, consultant and contractor to share Project experience and best practice for E&S protection. An organogram illustrating the interfaces between the Project environmental and social team teams is shown in Figure 8-1.

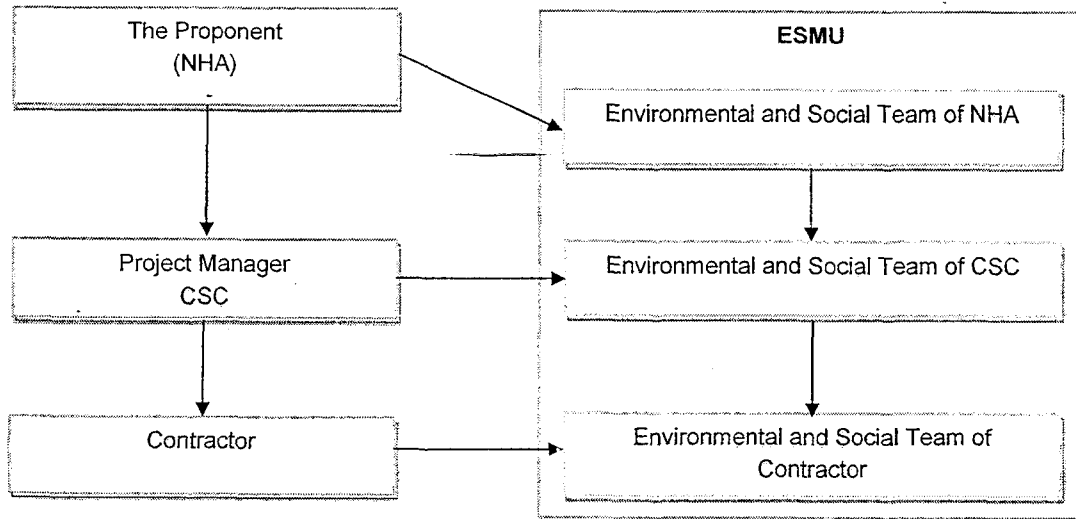


Figure 8-1: Organogram illustrating interface between the Project environmental and social teams



### 8.5.3 Establishment of Environmental and Social Management Unit

#### 8.5.3.1 The Proponent Staff

Overall responsibility for environmental management will rest with NHA. The nominated Project Manager (PM) of NHA will ensure that EMP has been made part of the contract document and will depute full time dedicated environmental and social staff for the project. In case of non-availability of the environmental and social staff from the existing staff the PM will appoint new staff for EMMP till the construction phase of the project. The environmental and social team of NHA (EST-NHA) will include following staff;

- Manager Health, Safety and Environmental (HSE), Deputy Director Level;
- Sociologist (Assistant Director Level)

Environmental and social team of NHA (EST-NHA) for project will assume overall responsibility for ensuring:

- That while executing the contract and undertaking the construction all environmental norms, regulations and requirements promulgated by Environmental Protection Agency (EPA) with respect to the work site and adjacent areas are fully respected and implemented by CSC.
- The proponent environmental and social team will ensure that CSC has appointed and nominated team for environmental and social monitoring of the Project.
- ESMU is established from the start of the project.
- Organize regular monthly meeting of the ESMU chaired by Manager HSE NHA.
- Ensure that minutes of meeting (MOM) are recorded by Environmental and social team and circulated among all the participants.
- Implementation of the EMMP during operational phase.

#### 8.5.3.2 The consultant Environmental and Social Team (EST-CSC)

The CSC will ensure that during construction all environmental norms, regulations and requirements promulgated by Environmental Protection Agency (EPA) with respect to the work site and adjacent areas are fully respected and implemented by the contractor. CSC will appoint full time designated team of environmental and social staff for the supervision of EMMP. The Environmental and Social team of CSC (EST-CSC) will include following staff.

- Sr. Environmentalist or Environmental Engineer;
- Sr. Sociologist/ Community Liaison Officer; and
- Five HSE Inspectors (One for each di).

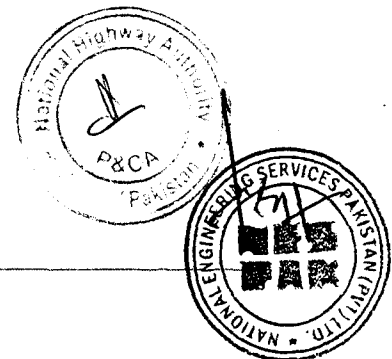
The EST-CSC will be responsible to;

- Take prime responsibility for the environmental management of the Project as a whole in compliance with requirements of the EPA and EMMP.
- Review and approve the Project EMMP prepared by the contractor.
- Review reporting and compliance audits undertaken by contractor's environmental engineers
- Review and report on performance of the contractor to the EPA (as required)
- Prepare compliance reports on progress of achieving obligations identified in the EMMP for submission to the NHA and EPA.
- Report on a daily basis any EMMP non-compliances to the Contractor General Manager
- Act as public liaison officer representative for NHA.

#### 8.5.3.3 The Environmental and social team of Contractor (EST-C)

The appointed contractor will be required to agree to the following actions:

- Develop a Project EMMP;
- Implement the requirements of the mitigation activities in the EMMP;



- Provide a construction site layout plan that identifies key activity area including lay down, accommodation and parking etc. prior to commencement of works;
- Provide all training necessary to oversee and implement EMMP requirements
- Identify and employ an appropriately qualified and experienced full time Environmental and social team on site (EST-C) with dedicated Environmental, Social and Health & Safety (ESHS) responsibilities to oversee works on site;
- The Contractor will be responsible for the ESHS performance of sub-contractor(s)' including subcontractor(s) adherence to the requirements of the EMMP. All sub-contractor(s) will be required to have dedicated environmental and social staff to implement the EMMP and to monitor and manage this on an on-going basis. The sub-contractor(s) staff will be required to liaise closely with the EST-C and obligations will include the provision of monthly reports and participation in weekly construction review meetings etc.

Contractors shall employ a qualified team for managing ESHS issues at site on daily basis within a week of the signing of the agreement. The team members of EST-C are given in Table-8.2 below.

**Table-8.2: Members of the EST-C**

Sr. #	Designation	Total Number of Staff	Input
1	Manager/ Environmental, Social, Health and Safety	1	Full time
2	Sr. Environmental Engineer or Scientist	1	Full time
3	Sr. Social Scientist/ Sociologist/ Community Liaison Officer	1	Full time
4	Jr. Community Liaison Officer	3 One for each district *	Full time
5	Health and Safety Inspector (s)	One for each construction site*	Full time
6	MBBS Doctor	1	
7	First Aiders	One for each construction site*	Full time

\* Staff number to be decided and approved by the EST-CSC.

The EST-C will have the following responsibilities:

- Implementing the EMMP during the construction phase
- Supervising the construction activities for the environmental and social aspects
- Participation in the ESMU
- Take prime responsibility for practical implementation of ESHS management measures
- Oversee and ensure the implementation of the EMMP (with support from the Contractor Construction Site Manager and ensure all subcontractor(s) are in compliance with the EMMP requirements
- Review and report performance to the Construction Site Manager and EST-CSC
- Review sub-contractor(s) E&S protection/mitigation measures to ensure compliance with the EMMP
- Report on a daily basis any EMMP non-compliances to the Construction Site Manager
- Carry out regular ESHS awareness sessions/toolbox talks and assist personnel in applying ESHS standards on site
- Conduct regular audits and inspections to check that committed impact mitigation measures are being implemented
- Act as the first point of contact on ESHS matters for the Contractor, government authorities, other external bodies and the general public.

#### 8.5.4 Chance finds procedures

The procedures of "Chance Find" should be incorporated into each sub-project EMMP and civil works contracts and following is proposed in this respect:

If the Contractor discovers archaeological sites, historical sites, remains and objects during excavation or construction, the Contractor shall:



- Stop the construction activities in the area of the chance find;
- Delineate the discovered site or area;
- Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities/ officers from Archaeological department;
- Notify the supervisory Environmental Engineer of EST–CSC, EST–NHA and Project Manager. The Project Manager NHA and EST–NHA will then notify the Archaeological department immediately (within 24 hours or less);

Archaeological department would then be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by the Archaeological department. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage, namely the aesthetic, historic, scientific or research, social and economic values.

Decisions on how to handle the finding shall be taken by the Archaeological department. This could include changes in the layout (such as when finding irremovable remains of cultural or archaeological importance) conservation, preservation, restoration and salvage. Implementation for the authority decision concerning the management of the finding shall be communicated in writing by Archaeological department.

- Construction work may resume only after permission is given from the Archaeological department concerning safeguard of the heritage. It may require change in the road alignment and design.

#### 8.5.5 Grievance Redress Mechanism (GRM)

Grievance Redress Mechanism (GRM) is important for developmental projects where ongoing risks or adverse impacts are anticipated. This mechanism serves as a way to meet requirements, prevent and address community concerns, reduce risks, and assist larger processes that create positive social change. The major objective of GRM is to implement and maintain a procedure for handling environmental and social concerns of the project stakeholders. This procedure will include a redress mechanism scaled to the project's identified risks and adverse impacts, focusing on stakeholders.

Project Director will establish a Grievance Redress Committee (GRC) to facilitate resolution of complaints by Affected People (APs) and grievances about the project's environmental performance. The GRC will be coordinated by the Deputy Director – Environment. The GRC will address affected people concerns and complaints promptly, using an understandable and transparent process.

#### 8.5.6 Composition of GRC

The GRC will work directly under the supervision of Project Director. The Project Director will be responsible to take the action and resolving the issues. The following members are recommended to form a GRC to look into the environmental matters.

- DD Environment.
- Representative from APs.
- Environmental Engineer of Supervision Consultant.
- Environmental Engineer of Construction Contractor.

Director Environment will nominate one Deputy Director as member of GRC and shall act as Project Environmental Grievance Officer (PEGO).

He will review the case on merit and address the problem in accordance with prevailing rules/ procedures applicable to such grievances as per Environmental Management Plan (EMP). The PEGO will then refer the case to GRC for final decision, whether to update and make necessary amendments in EMP. The GRC will deliver its decision within thirty (30) days of registration of the case. If the affected person does not receive a response from GRC within thirty (30) days of the registry of the complaint, he/she can appeal to Director Environment, who should act on the compliant/ grievance within two



weeks of day of its filing. If the affected person is not satisfied with the decision of Director Environment, then it can be referred to higher authorities / relevant govt. departments for its resolution. As a last resort, he/she may submit the complaint to Pak EPA. The flow chart of the proposed redress mechanism is shown below in Figure 8-2.

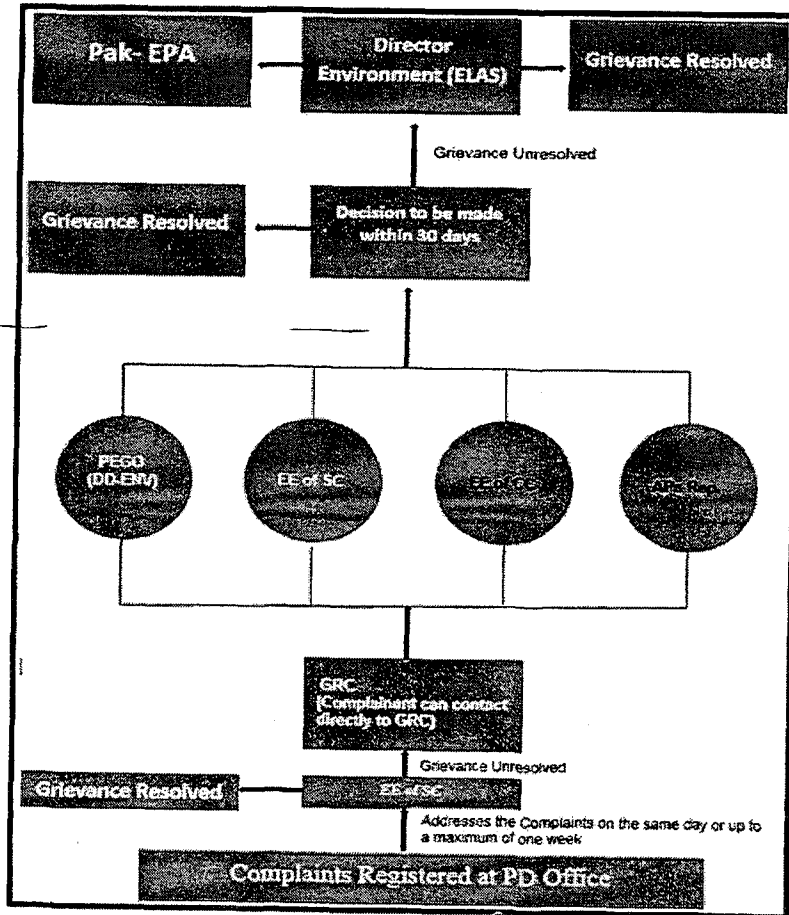


Figure 8-2: Flow Chart of the Proposed Grievance Redress Mechanism

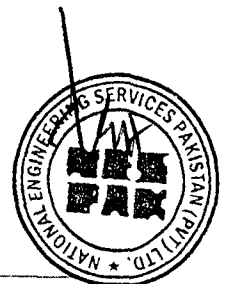
### 8.6 Monitoring Schedule

The monitoring will be initiated right from the date of mobilization of the Contractor. The table below also indicate responsibility of implementation, monitoring frequency and responsibility of agencies involved.

#### 8.6.1 Photographic Record of Project Area

The EST-CSC shall take photographs of the important and sensitive project sites prior to start of construction. The following information for each shot shall be maintained:

- Shot number,
- Title of photograph,
- Date,
- Time, and
- Photographic features.



### 8.6.2 Storage of Information

The electronic database will be established covering the following information about the EMMP:

- Training programs,
- Staff deployment,
- Non-compliance,
- Corrective actions,

Environmental data will be maintained about the following parameters.

- Soil and land pollution,
- Disposal of waste material at proper places and manner
- Fuel or oil spills.
- Noise pollution
- Dust pollution
- Smoke pollution
- Vegetation and trees cut and compensatory plantation

### 8.6.3 Meetings

Before start of the project construction Environmental and Social Management Unit (ESMU) will be established at project level to safeguard the environment of the area. ESMU meetings will play very important role in construction activities. Regular monthly meetings among EST-NHA, EST-CSC and EST-C will be organized by EST-NHA. The purpose of these meetings would be to discuss the ESHS issues and non-compliances noted by EST-NHA and EST-CSC and adaptation of adequate measures for their remedies. ESMU meetings will be arranged in each district periodically and minutes of meetings shall be recorded by the EST-CSC for circulation to project management and all stakeholders.

### 8.6.4 Reports

The EST-CSC will produce monthly reports of the project based on the ESHS compliances and issues to EST-CSC for onward submission to all concerned as per Table-8.3 below.

**Table-8.3: Preparation of Periodic Reports**

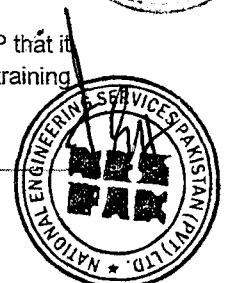
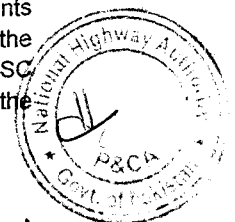
Report	Prepared by	Reviewed by	Distribution
Weekly	EST-C	EST-CSC	Project Manager CSC, EST-NHA
Monthly	EST-CSC	EST-NHA	Project Manager CSC, NHA and EPA
Annual	EST-CSC	EST-NHA	Project Manager CSC, NHA and EPA
Final Report upon Completion of project.	EST-CSC	EST-NHA	Project Manager CSC, NHA and EPA

### 8.6.5 Complaints Register

The EST-C will maintain a complaint register at the construction site(s) document all complaints received from the local communities. The register will also record the measures taken to mitigate the reported concerns. All of these concerns shall be documented in the monthly reports by the EST-CSC in the periodic reports. The status of the closeout concern shall be verified and counter signed by the designated official of EST-CSC.

### 8.6.6 Training Plan

Environmental training will help to ensure the process of carrying out the requirements of EMMP that it is clearly understood and followed by all project personnel. The primary responsibility to provide training



to all the project personnel will be that of EST-C and EST-CSC. The indicative training detail that would be provided to different professional, semi-professional and occupational groups at the managerial, skilled and unskilled levels is described in Table-8.4 below.

**Table-8.4: Indicative Training Program**

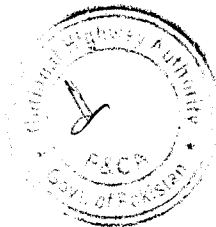
Staff	Trainer	Contents	Schedule
Contractor personnel	EST-C and EST-CSC	<ul style="list-style-type: none"> <li>- Mitigation measures</li> <li>- Social and cultural values of the area</li> <li>- Importance of Environmental, Health and Safety</li> <li>- Importance and use of PPE</li> </ul>	Before and regularly during construction.
Contractor construction crew: Skilled labours Unskilled labours	EST-C	<ul style="list-style-type: none"> <li>- Importance of Environmental, Health and Safety</li> <li>- Use of Personal Protective Equipment's.</li> </ul>	Same as above.
Drivers	EST-C	<ul style="list-style-type: none"> <li>- Road safety</li> <li>- Road restrictions</li> <li>- Vehicle restrictions</li> <li>- Defensive driving</li> <li>- Social and cultural values of the area.</li> </ul>	Same as above.
Camp staff	EST-CSC and EST-C	<ul style="list-style-type: none"> <li>- Camp operation</li> <li>- Waste disposal</li> <li>- Natural resource conservation</li> <li>- Housekeeping</li> </ul>	Same as above.
Restoration team	EST-CSC and EST-C	<ul style="list-style-type: none"> <li>- Waste disposal</li> <li>- Levelling and dewatering of borrow area and diversion channels</li> </ul>	Before start of restoration activity.

#### 8.6.7 Environmental Audit

It is proposed to arrange environmental audits of the project on biannual basis. The objective of the environmental audit is to have an independent evaluation of the environmental obligations of the executing agency of the project. Environmental auditing is generally done by an unbiased sovereign organisation or a person having full command on the subject. The terms of reference for environmental audits will be designed by the EST-CSC with the collaboration of EST-NHA. The findings of the environmental audits will be circulated to project management and EPA and other interested parties and stakeholders.

#### 8.6.8 Environmental and Social Cost Estimates

An estimated environmental management and monitoring budget of **Rs. 147.018 million** has been proposed for construction period as detailed in Table 8-5 below.





**Table-8.5: Environmental Management and Monitoring Cost**

Sr. #	Item	Quantity of Samples	Unit Cost (Rs.)	Total Cost (M. Rs.)
<b>A. Monitoring Activities</b>				
1	Quarterly Surface Water Quality Monitoring 1-site; - Point where road crosses D.G.Khan canal / where bridge to be built.	Biannual. Two composite samples from upstream and downstream of proposed bridge	Lump sum (L.S)	0.150
2	Ground/ Drinking Water Quality Monitoring; Three samples -Contractor cap sites from each district (Rajanpur, DG Khan and DI Khan) from Project tube well or tube well from nearby villages located within 100m from the centreline of proposed 4-Lane Highway	Biannual	6 samples @ Rs. 30000 per sample	0.150
2	Ambient Air Quality Monitoring Three sites - One from each district (Rajanpur, DG Khan and DI Khan)	Biannual	6 samples @ Rs. 150,000 per sample	0.900
3	Noise Level Monitoring Three sites - One from each district (Rajanpur, DG Khan and DI Khan)	Biannual	Rs. 25,000 (01 Noise Meter)	0.025
<b>Sub. Total</b>				<b>1.225</b>
<b>B. Tree Plantation</b>		Total existing trees = 6459	Rs. 100,000 per avenue mile =	129.20
Compensatory Plantation - Ten trees to be planted against one tree cut. The cost of planting tree sapling including its after care for five years		Trees to be planted = $645900/500 = 1292$ avenue miles	1292 x 100,000	
<b>Sub. Total</b>				<b>129.200</b>
<b>C</b>	<b>Environmental Audit</b>	Initial during first year of construction and second soon after project completion.	250,000	0.500
<b>D</b>	<b>Environmental Analysis cost</b>			3.000
<b>Total (A+B+C)</b>				<b>130.925</b>
				Contingencies @ 10%
				13.0925
<b>Grand Total (Rs)</b>				<b>147.018</b>



# Drawings

Tender Drawings are attached to the Bidding Document.

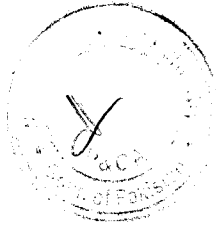


## Supplementary Information Regarding Works to Be Procured

Standard Operation Procedures (SOPs) issued by Government of Pakistan from time to time, local regulations, and guidance specific to COVID-19 prevention and controls, and worksite safety measures requirements that are deemed applicable to the contract, as well as the applicable international good practices on Health and Safety for the contract.

### Site Specific Health and Safety Management Plan (SSHSMP)

**Standard Operating Procedures (SOPs):** *All Standard Operating Procedures (SOPs) issued by the Government of Pakistan from time to time on COVID-19 prevention and controls, as well as workplace safety requirements, with international good practice guidelines [World Health Organization, Considerations for public health and social measures in the workplace in the context of COVID-19. Geneva. Available here: <https://www.who.int/publications-detail/considerations-for-public-health-and-social-measures-in-the-workplace-in-the-context-of-covid-19>] and SOPs (<http://covid.gov.pk/>) will be applicable.*



## Key Personnel Requirements

Using Form PER – 1 and PER – 2 in Section 4 (Bidding Forms), the Bidder must demonstrate that it has personnel who meet the following requirements:

No	Position	Minimum Qualification	Total Work Experience (years)	Experience in Similar Work (years)	No of Positions Required for Each Lot			
					Lot-1	Lot-2	Lot-3	Lot-4
1	Project Manager	BE (Civil Engineering)	20	10	1	1	1	1
2	Deputy Project Engineer/ Planning Engineer	BE (Civil Engineering) or equivalent	10	5	1	1	1	1
3	Material Engineer	BE (Civil Engineering) / Geological or equivalent	10	5	2	2	2	2
4	Structure Engineer	MS Structure Engineering	10	5	2	2	2	2
5	Highway Engineer	BE (Civil Engineering)	10	5	4	4	4	4
6	Qualified / Experienced Surveyors	DAE (Civil Engineering)	15	10	4	4	4	4
7	Gender Specialist	Master's in social sciences or equivalent Professional qualification	10	5	1	1	1	1
8	Quantity Surveyor	DAE (Civil Engineering)	15	10	2	2	2	2
9	Site Engineers	BE (Civil Engineering) or equivalent Professional qualification	10	5	6	6	6	6

Using Form EXP-6 in Section 4 (Bidding Forms), the Bidder must demonstrate that it has EHS personnel who meet the following requirements:



**Key Personnel as determined by the EMP and other safeguard management plans<sup>8</sup>**

No	Position/ Specialization	Academic Qualifications	Minimum Years of Relevant Work Experience (Year)	Minimum Time On- site (%FTE)	No of Positions Required for Each Lot			
					Lot- 1	Lot- 2	Lot- 3	Lot- 4
1	Qualified Environmentalist	M.Sc. (Environment) or equivalent Professional qualification	10	50%	1	1	1	1
2	Qualified Health and Safety Expert	M.Sc. (Public Health Engineering) or equivalent Professional qualification	10	50%	1	1	1	1



<sup>8</sup> For projects categorized as Category C for environment for which no EMP has been prepared, the below table should not be taken into consideration.

# Equipment Requirements

Using Form EQU in Section 4 (Bidding Forms), the Bidder must demonstrate that it has the key equipment listed below:

No	Position/ Specialization	Capacity	Minimum Number Required for Each Lot			
			Lot-1	Lot-2	Lot-3	Lot-4
1.	Dump Trucks	18 Tons	60	60	60	60
2.	Dump Trucks	10 Tons	8	8	8	8
3.	Excavator (Track Type)	100 HP	12	12	12	12
4.	Front End Loaders	2-3.6 m <sup>3</sup>	8	8	8	8
5.	Front End Loaders	1.5 m <sup>3</sup>	6	6	6	6
6.	Graders	140 HP	12	12	12	12
7.	Roller	18 ton	21	21	21	21
8.	Combination Roller	10-12 Tons	16	16	16	16
9.	Tractor	50HP	10	10	10	10
10.	Water Tanker Browser Type	12,000 LTR	36	36	36	36
11.	Shovel		2	2	2	2
12.	Grader	165 HP	10	10	10	10
13.	Static Tandem Roller	12 Ton	6	6	6	6
14.	Static Tandem Roller	8 Ton	3	3	3	3
15.	Water Tanker Browser Type	4,000 LTR	7	7	7	7
16.	Asphalt Paver (4 m wide)	-	3	3	3	3
17.	Aggregate Base Course Paver	-	2	2	2	2
18.	Bitumen Distributer	-	2	2	2	2
19.	Bitumen Distributer (Tow type)	2,000 LTR	3	3	3	3
20.	Tandem Vibratory Roller	10-12 Ton	6	6	6	6
21.	PTR (9 Wheeler)	18 Ton	12	12	12	12
22.	Asphalt Plant	80 Ton	1	1	1	1
23.	Concrete Batching Plant	30 m <sup>3</sup>	2	2	2	2
24.	Concrete Transit Mixer	6 m <sup>3</sup>	20	20	20	20
25.	Bull Dozer	120 HP	5	5	5	5
26.	Crane	20 T	4	4	4	4
27.	Piling Rig	1 m Dia	2	2	2	2
28.	Piling Rig	1-1.5 m Dia	2	2	2	2
29.	Girder Launcher	-	2	2	2	2
30.	Concrete Pump	-	3	3	3	3



# Section 7: General Conditions of Contract

The Conditions of Contract consists of two parts, this Section 7 (General Conditions of Contract) and the following Section 8 (Particular Conditions of Contract).

## Red Book:

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The Conditions of Contract are the “General Conditions” which form part of the “Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer (‘Red book’) Second edition 2017 Reprinted 2022 with amendments” published by the Federation Internationale Des Ingenieurs – Conseils (FIDIC) and the following Section 8 “Particular Conditions of Contract.”

An original copy of the above FIDIC publication i.e. “Conditions of Contract for Building and Engineering Works Designed by the Employer” must be obtained from FIDIC.

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# Section 8: Particular Conditions of Contract

## Part A – Contract Data

Ref. Sub-Clause (Col 1)	Conditions (Col 2)	Data (Col 3)
1.1.20 Percentage of Profit	Where the Contract allows for Cost Plus Profit, percentage profit to be added to the Cost	Five Percent (5%)
1.1.27	Defects Notification Period	Lot-1: 365 days Lot-2: 365 days Lot-3: 365 days Lot-4: 365 days
1.1.31	Employer's name and address	Member (Aided Projects), National Highway Authority 28-Mauve Area, G-9/1, Islamabad
1.1.35	Engineer's name and address	Team Leader of the Construction Supervision Consultant shall be appointed as the Engineer. Name of The Engineer will be communicated before commencement of work.
1.1.73	Sections	Not Applicable.
1.1.84	Time for Completion	Lot-1: 730 days Lot-2: 730 days Lot-3: 730 days Lot-4: 730 days
1.1.89	Bank's name	Asian Development Bank
1.1.90	Borrower's name	Islamic Republic of Pakistan
1.3 (a) (ii)	Electronic transmission system	Facsimile and Email
1.3(d)	Address of Employer for communications:	Member (Aided Projects), National Highway Authority 28-Mauve Area, G-9/1, Islamabad
1.3(d)	Address of Engineer for communications:	To be determined later, Employer will notify before commencement of work
1.3(d)	Address of Contractor for communications:	To be determined later, once bidding completed and contract awarded
1.4	Governing Law	Law of Islamic Republic of Pakistan
1.4	Ruling language	English
1.4	Language for communications	English
1.8	Number of additional paper copies of Contractor's Documents	Six (6) copies

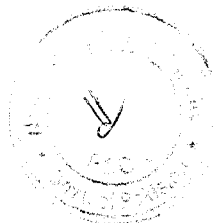


Ref. Sub- Clause (Col 1)	Conditions (Col 2)	Data (Col 3)
1.15	Total liability of the Contractor to the Employer under or in connection with the Contract	The product of 1.15 times the Accepted Contract Amount
2.1	Time for access to the Site	<p>The right of access to and possession of the whole of the Site is to be given in several parts with 06 months stagers after the Commencement Date as stated below:</p> <p><b><u>Lot-1: Rajanpur – Jampur Section (57.50 Km)</u></b>            (i) Rajanpur Bypass [Km 00+550 to Km 10+700 (10.15 Km)]            (ii) Fazalpur Bypass [Km 28+500 to Km 37+500 (9.0 Km)]            (iii) Muhammadpur Bypass [Km 52+350 to Km 57+500 (5.15 Km)]</p> <p><b><u>Lot-2: Jampur – DG Khan Section (64.0 Km)</u></b>            (i) Jampur Bypass [Km 68+400 to Km 83+150 (14.75 Km)]            (ii) Mana Bypass [Km 93+400 to Km 97+100 (3.7 Km)]            (iii) DG Khan Bypass [Km 101+350 to Km 121+500 (20.15 Km)]</p> <p><b><u>Lot-3: DG Khan to Tibi Qaisrani via Shahdan Lund Section (111.70 Km)</u></b>            (i) Shah Sadar Din [Km 145+885 to Km 150+285 (4.40 Km)]            (ii) Kala Bypass [Km 159+223 to Km 162+718 (3.495 Km)]            (iii) Shahdanlund Bypass [Km 167+460 to Km 176+470 (9.01 Km)]            (iv) Taunsa Bypass [Km 194+750 to Km 208+000 (13.25 Km)]</p> <p><b><u>Lot-4: Tibi Qaisrani to DI Khan via Ramak Section (96.245 Km)</u></b>            (i) Ramak Bypass [Km 274+772 to Km 280+231 (5.459 Km)]</p>
2.4	Employer's Arrangements                      Financial	Asian Development Bank (ADB) Loan 4416-PAK:Central Asia Regional Economic Cooperation (CAREC) Corridor Development Investment Program–Tranche 3
3.2	Engineer's Duties and Authority	<p>A Variation resulting in an increase of the Accepted Contract Amount in excess of 0.1% shall require prior consent of the Employer.</p> <p>Similarly, when cumulative of all Variations results in an increase of the Accepted Contract Amount in excess of 0.1%, any further Variation shall require prior consent of the Employer.</p>
4.2	Performance Security	The Performance Security shall be in the form of an unconditional bank guarantee in the

Ref. Sub- Clause (Col 1)	Conditions (Col 2)	Data (Col 3)
		<p>amount(s) of ten percent (10%) of the Accepted Contract Amount and in the same currency(ies) of the Accepted Contract Amount.</p> <p>An additional Performance Security shall be submitted by the Contractor in the form of an unconditional bank guarantee in the same currency (ies) of the Accepted Contract Amount, if required by the Employer due to seriously unbalanced or front-loaded bid or abnormally low bid, in accordance with ITB 36 and 37. The requirement and amount of additional performance security shall be determined after evaluating the bid.</p>
4.7.2 (a)	Period for notification of errors in the items of reference	28days.
4.19	Period of payment for temporary utilities	Each month
4.20	Number of additional paper copies of progress reports	Six (06) copies.
5.1(a)	Maximum allowable accumulated value of work subcontracted (as a percentage of the Accepted Contract Amount)	Fifteen Percent (15%)
5.1(b)	Parts of the Works for which subcontracting is not permitted	Not Applicable.
6.5	Normal working hours	<p>8:00 AM to 5:00 PM inclusive of one hour breakor as specified by the Engineer.</p> <p>The Contractor shall have the option to work continuously in multiple shifts by day and night. However, the Contractor shall at its own cost provide and maintain such good and sufficient light as will enable to proceed the work satisfactorily and in a safe manner without danger. In such scenario, the Contractor shall take the Engineer's prior approval on the lighting arrangement, safety aspects and schedule of its work shifts.</p> <p>The working hours specified under this section shall at all times comply with the relevant provisions of the governing law.</p>
8.3	Number of additional paper copies of program	Six (06) copies.

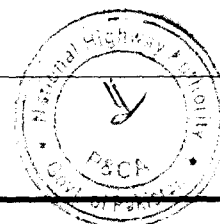


Ref. Sub- Clause (Col 1)	Conditions (Col 2)	Data (Col 3)
8.8	Delay damages payable for each day of delay	0.1% of the Accepted Contract Amount per day, in the currencies and proportions in which the Contract Price is payable.
8.8	Maximum amount of delay damages	Ten Percent (10%) of the Accepted Contract Amount.
12.2	Method of measurement	<p>It shall be in accordance with the Bill of Quantities, other applicable Schedule(s), or other relevant provisions of the Contract.</p> <p>In case of any inconsistency among various documents, Sub-Clause 1.5 [Priority of Documents] shall be followed.</p> <p>In case the method of measurement is not specified anywhere for any specific item of work, the Engineer shall specify an appropriate method of measurement based on recommended engineering practice.</p>
12.3	Percentage profit	Five Percent (5%)
13.4 (b)(ii)	Percentage rate to be applied to Provisional Sums for overhead charges and profit	Twelve Percent (12%)



Ref. Sub- Clause (Col 1)	Conditions (Col 2)	Data (Col 3)
14.2	Total Advance Payment	<p><b>Ten Percent (10%)</b> of the Accepted Contract Amount payable in the currencies and proportions in which the Accepted Contract Amount is payable provided that the Contractor delivers the corresponding bank guarantee for advance payment to the Employer in a timely manner.</p> <p><b>Ten Percent (10%)</b> of the Accepted Contract Amount payable in two equal instalments in the currencies in which the Accepted Contract Amount is payable. The first instalment shall be paid after the Contractor furnishes the advance payment guarantee required by Sub-Clause 14.2 [Advance Payment], and the second instalment shall be paid after the Contractor completes mobilization and the Engineer issues a certification to the Employer of such completion. For the avoidance of doubt, (i) the release of the second instalment will be conditioned on the provision of an advance payment guarantee equivalent to the value of the second instalment pursuant to the satisfaction of (as applicable) items (ii) and/or (iii); (ii) the complete mobilization required to release the second instalment shall mean the Contractor's mobilization of all of the equipment and human resources required for the execution of the first 3 months of the Permanent Works in accordance with the programme submitted by the Contractor under Sub Clause 8.3 [Programme]; and (iii) if the Contractor is a joint venture, the release of the second instalment shall be further conditioned upon the certification of the Engineer that all resources have been mobilized to site in accordance with the joint venture agreement.</p>
14.2.3	Repayment of Advance payment	<p>(a) exceeds 10% of the portion of the Accepted Contract Amount payable in that currency less Provisional Sums; and</p> <p>(b) deductions shall be made at the amortization rate of 25%; provided that the advance payment shall be completely repaid prior to the time when 90 percent (90%) of the Accepted Contract Amount Less Provisional Sums has been certified for payment.</p>
14.3	Period of payment	<b>After the end of each month</b>
14.3(b)	Number of additional paper copies of Statements	<b>Six (6) copies</b>
14.3(iii)	Percentage of retention	<b>Five Percent (5%)</b>

<b>Ref. Sub- Clause (Col 1)</b>	<b>Conditions (Col 2)</b>	<b>Data (Col 3)</b>
14.3(iii)	Limit of Retention Money (as a percentage of Accepted Contract Amount)	<b>Five Percent (5%)</b>
14.5(b)(i)	Plant and Materials	<b>Plant and Materials for Payment when shipped: Not Applicable</b>
14.5(c)(i)		<b>Plant and materials for payment when delivered to the Site: Steel Reinforcement (Grade 60). Asphalt Cement (Grades 60-70 and 80-100) only if stored in sealed drums. Cement (OPC).</b>
14.6.2	Minimum Amount of Interim Payment Certificates	<b>Three Percent (3%) of the Accepted Contract Amount</b>
14.7(a)	Period of payment of Advance Payment to the Contractor	<b>Twenty-eight (28) days</b>
14.7b(i)	Period for the Employer to make interim payments to the Contractor under Sub-Clause 14.6 (interim Payment)	<b>Fifty-six (56) days</b>
14.7b(ii)	Period for the Employer to make the Final Payment to the Contractor under Sub-Clause 14.13	<b>Twenty-eight (28) days</b>
14.7(c)	Period for the Employer to make final payment to the Contractor	<b>Fifty-six (56) days</b>
14.8	Financing charges for delayed payment (percentage points above the average bank short-term lending rate as referred to under sub-paragraph (a))	The financing charges shall be calculated at the annual rate of three percentage points above the Karachi Interbank Offered Rate (3%+KIBOR) notified by the State Bank of Pakistan.  Online Source: <a href="https://www.sbp.org.pk/ecodata/kibor_index.asp">https://www.sbp.org.pk/ecodata/kibor_index.asp</a>
14.11.1(b)	Number of additional paper copies of draft Final Statement	<b>Six (6) copies</b>
17.2(d)	Forces of nature, the risks of which are allocated to the Contractor	<b>Nil</b>
19.1	Permitted deductible limits.	<b>PKR 10.0 million</b>
19.2.1(b)	Additional amount to be insured (as a percentage of the replacement value, if less or more than 15%)	<b>Fifteen Percent (15%)</b>
19.2.1(iv)	List of Exceptional Risks which shall not be excluded from the insurance cover for the Works	<b>Nil</b>



<b>Ref. Sub- Clause (Col 1)</b>	<b>Conditions (Col 2)</b>	<b>Data (Col 3)</b>
19.2.2	Extent of insurance required for Goods	<b>For their full replacement value including delivery to the Site</b>
	Amount of insurance required for Goods	<b>Full replacement cost including delivery to the Site</b>
19.2.3(a)	Amount of insurance required for liability for breach of professional duty	<b>1.15 times of the Accepted Contract Amount</b>
19.2.3(b)	Insurance required against liability for fitness for purpose	<b>Yes (in respect of the Contractor's design obligations only)</b>
19.2.3	Period of insurance required for liability for breach of professional duty	<b>Until the End of Defects Notification Period.</b>
19.2.4	Amount of insurance required for injury to persons and damage to property	<p><b>Minimum amount of third-party insurance(s):</b></p> <ul style="list-style-type: none"> <li>- PKR 7 million per occurrence in case of injury to persons,</li> <li>- PKR 10 million per occurrence in case of an injury to persons leading to a long-term disability,</li> <li>- PKR 15 million per occurrence in case of an injury to persons leading to a permanent disability,</li> <li>- PKR 20 million per occurrence in case of death, and</li> <li>- 1% of the Accepted Contract Amount, per occurrence in case of damage to property.</li> </ul> <p>Number of occurrences: Unlimited, for the entire Time for Completion.</p>
19.2.6	Other insurances required by Laws and by local practice (give details)	<b>As per applicable law</b>
21.1	Time for appointment of Dispute Avoidance/Adjudication Board (DAAB) member (s)	<b>28 days after the Commencement Date</b>
21.1	The DAAB shall comprise	<b>Three (3) Members</b>



Ref. Sub- Clause (Col 1)	Conditions (Col 2)	Data (Col 3)
21.1	List of proposed members of DAAB	<p>Proposed by Employer</p> <p>1. Mr. Atiq Ahmed 2. Mr. Saeed Khilji 3. Mr. Iftikhar Ali</p> <p>Proposed by Contractor</p> <p>1. _____ 2. _____ 3. _____</p> <p><b>To be provided by the Bidder at the time of bid submission.</b></p>
21.2	Appointment (if not agreed) to be made by	<b>Chartered Institute of Arbitrators, Pakistan Chapter.</b>
21.6 (a)(i)	Rules of arbitration and administration of arbitration proceedings	<p><b>For International Arbitration:</b> International arbitration shall be (i) administered by: Singapore, International Arbitration Centre (SIAC); and (ii) conducted in accordance with the rules of Singapore International Arbitration Centre (SIAC).</p> <p>The Rules of Arbitration of the Singapore International Arbitration Centre (SIAC), with proceedings administered by SIAC shall apply.</p> <p><b>For Domestic Arbitration:</b> Arbitration Act, 1940 (Act No. X of 1940) of Pakistan (as amended, modified, re-enacted or replaced thereof and in force on the date of the submission of the request for arbitration).</p>
21.6 (a)(ii)	Number of arbitrators	Three (3) arbitrators.
21.6 (a)(iii)	Place of arbitration	<p>In case of foreign contractor, the place of arbitration shall be Singapore or any other neutral place/mutually agreed upon by both contracting parties, which shall neither be in the Employer's country nor in the foreign contractor's country.</p> <p>In case of domestic Contractor, place of arbitration shall be Islamabad, Pakistan.</p>

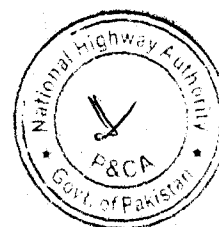
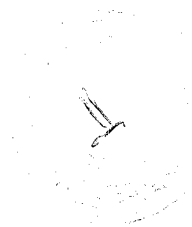


Table: Summary of Sections (if any)

Description of parts of the Works that shall be designated a Section for the purposes of the Contract (Sub-Clause 1.1.73)	Value: Percentage* of Accepted Contract Amount (Sub-Clause 14.9)	Time for Completion (Sub-Clause 1.1.84)	Delay Damages (Sub-Clause 8.8)

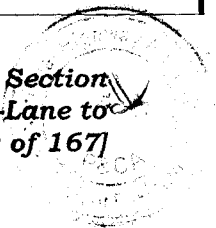
NOT APPLICABLE





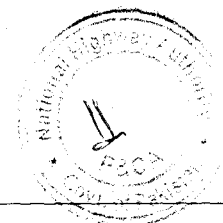
## Part B – Special Provisions

Clause/Sub-Clause	Special Provisions
Sub-Clause 1.1.16 Contractor's Equipment	The following is added at the end of the definition.  The Contractor's Equipment include, but not limited to the equipment stated in the Specification.
Sub-Clause 1.1.74 Site	The Sub-Clause is replaced with:  "Site" means the places where the Permanent Works are to be executed, including storage and working area, and to which Plant and Materials are to be delivered, and any other places specified in the Contract as forming part of the Site."
Sub-Clause 1.1.76 Specification	The following is added to the definition.  The Specification includes Environment, Health and Safety Management Plan; Key Personnel requirement; and Equipment requirements.
New Sub-Clause 1.1.89 Bank	"Bank" means the financing institution (if any) named in the Contract Data
New Sub-Clause 1.1.90 Borrower	"Borrower" means the person (if any) named as the borrower in the Contract Data
Sub-Clause 1.2 Interpretation	Sub-paragraph (a) is replaced with the following: "Words indicating one gender include all genders; "he/she" is replaced with: "it"; "him/her" is replaced with "it"; "his" and "his/her" are replaced with: "its"; "himself/herself" are replaced with: "itself"."  Further, "and" is deleted from the end of sub-paragraph (i) and added at the end of sub-paragraph (j). sub-paragraph (k) is added:  (k) "The word "tender" is synonymous with "bid" or "proposal", the word tenderer with "bidder" or "proposer" and the words "tender documents" with "request for bids documents" or "request for proposal documents", as applicable."
Sub-Clause 1.5 Priority Documents of	Delete sub-paragraphs from (a) to (k) and replace with the following;  (a) the Contract Agreement; (b) the Letter of Acceptance; (c) the Letter of Bid; (d) the Particular Conditions Part A – Contract Data;

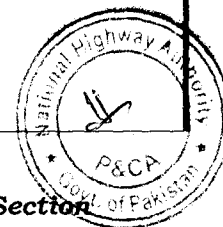


Clause/Sub-Clause	Special Provisions
	<p>(e) the Particular Conditions Part B – Special Provisions;</p> <p>(f) the Particular Conditions Part C – Corrupt and Fraudulent Practices;</p> <p>(g) the Particular Conditions Part D - Environmental, Health, and Safety (EHS) Metrics for Progress Reports;</p> <p>(h) List of Eligible Countries as defined by the Bank.</p> <p>(i) these General Conditions.</p> <p>(j) the Specification including EMP, EHS, personnel and equipment requirements.</p> <p>(k) the Drawings.</p> <p>(l) Completed Schedules including Bill of Quantities.</p> <p>(m) Environment, Health and Safety Code of Conduct for Contractor's Personnel.</p> <p>(n) Environment, Health and Safety Management Plan (EHSMP).</p> <p>(o) the executed Joint Venture Agreement (if the Contractor is a Joint Venture);</p> <p>(p) Initial Environmental Examination (IEE);</p> <p>(q) Land Acquisition and Resettlement Plan (LARP); and</p> <p>(r) any other documents forming part of the Contract.</p>
Sub-Clause 1.6 Contract Agreement	<p>The last paragraph is replaced with:</p> <p>"If the Contractor comprises a Joint Venture, the authorized representative of the Joint Venture shall sign the Contract Agreement in accordance with Sub-Clause 1.14 [Joint and Several Liability]."</p>
Sub-Clause 1.12 Confidentiality	<p>The following is added at the end of the second paragraph: "The Contractor shall however be permitted to disclose such particulars if required to establish its qualifications to compete for other projects."</p> <p>"or" at the end of (b) is deleted.</p> <p>"or" at the end of (c) is added.</p> <p>The following is then added as (d): "is required to be provided to the Bank."</p>
New Sub-Clause 1.17 Inspections & Audit by the Bank	<p>The following Sub-Clause is added after Sub-Clause 1.16:</p> <p>"Pursuant to paragraph 2.1(e) of Particular Conditions - Part C- [Corrupt and Fraudulent Practices], the Contractor shall permit and shall cause its agents (whether declared or not), Subcontractors, subconsultants, service providers, suppliers, and personnel, to permit the Bank and/or persons appointed by the Bank to inspect the Site, assets and/or the accounts, records and other documents relating to the procurement process, selection and/or Contract execution/performance, and to have such accounts, records, and other documents audited by auditors appointed by the Bank. The Contractor's and its Subcontractors' and subconsultants' attention is drawn to Part C [Corrupt and Fraudulent Practices] which provides, inter</p>

Clause/Sub-Clause	Special Provisions
	<p>alia, that obstructive practice constitutes an integrity violation subject to Contract termination (as well as to a determination of ineligibility pursuant to the Bank's Anticorruption Policy and Integrity Principles and Guidelines, both as amended from time to time)."</p> <p>The Bank's right to inspect the Site, assets and/or the Contractor's accounts, records and other documents relating to the procurement and performance of the Contract stated in Sub-Clause 1.17 and Part C shall survive termination and/ or expiration of this Contract.</p>
<p>Sub-Clause 2.1 Right of Access to the Site</p>	<p>Add after the first sentence of the first paragraph:</p> <p>"For any part of the Site (or the whole Site as the case may be) for which the Contractor is to be given access to, and possession of, there shall be no physical works at the Site or any part thereof (as the case may be) unless the Employer shall give a Notice to the Contractor stating that all relevant provisions of the applicable Resettlement Plan (RP) were complied with and confirming that all compensation to the affected persons have been duly paid as per the RP. This Notice shall specify the date on which access to, and possession of the part of the Site (or the whole Site as the case may be) shall be given to the Contractor."</p>
<p>Sub-Clause 2.4 Employer's Financial Arrangements</p>	<p>The first paragraph is replaced with:</p> <p>"The Employer shall submit, before the Commencement Date, reasonable evidence that financial arrangements have been made for financing the Employer's obligations under the Contract."</p> <p>The following sub-paragraph is added at the end of Sub-Clause 2.4:</p> <p>"In addition, if the Bank has notified to the Borrower that the Bank has suspended disbursements under its loan, which finances in whole or in part the execution of the Works, the Employer shall give notice of such suspension to the Contractor with detailed particulars, including the date of such notification, with a copy to the Engineer, within 7 days of the Borrower having received the suspension notification from the Bank. If alternative funds will be available in appropriate currencies to the Employer to continue making payments to the Contractor beyond 60 days after the date of Bank notification of the suspension, the Employer shall provide reasonable evidence in its notice of the extent to which such funds will be available."</p>
<p>Sub-Clause 3.1 The Engineer</p>	<p>Add the following at the end of first paragraph</p> <p>"The Engineer shall be a third party capable of acting neutrally between the Parties".</p> <p>"and" at the end of (a) is deleted.</p> <p>"and" at the end of (b) is added.</p>

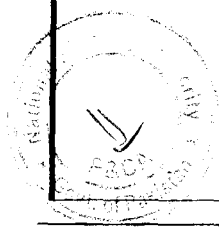


Clause/Sub-Clause	Special Provisions
Sub-Clause 3.2 Engineer's Duties and Authority	Add the following at the end of the third paragraph: The Engineer shall obtain the consent in writing of the Employer before taking action under the following Sub-Clauses of these Conditions: a) Sub-Clause 13.2 [Value Engineering]: stating consent or otherwise to a value engineering proposal submitted by the Contractor in accordance with Sub-Clause 13.2; or b) Sub-Clause 13.3 [Variation Procedure]: instructing a Variation, except: (i) if, in the opinion of the Engineer, an emergency situation occurs that may affect the safety of life or of the Works or of adjoining property. In such a situation, the Engineer may, without relieving the Contractor of any of his duties and responsibility under the Contract, instruct the Contractor to execute all such work, or to do all such things, as may, in the opinion of the Engineer, be necessary to abate or reduce the risk and the Contractor shall forthwith comply with such instruction; or (ii) if such a Variation would increase the Accepted Contract Amount by less than the percentage specified in the Contract Data.
Sub-Clause 3.3 Engineer's Representative	Add the following third paragraph after paragraph 2. "The Engineer shall obtain the consent of the Employer before appointing or replacing an Engineer's Representative." Add the following fourth paragraph after paragraph 3. "The Employer may require the Engineer to immediately remove (or cause to be removed) any Engineer's Representative who is found, based on reasonable evidence, to have engaged in corrupt, fraudulent, collusive or coercive practice."
Sub-Clause 3.4 Delegation by the Engineer	The following is added at the end of the second paragraph: "If any assistants are not fluent in this language, the Engineer shall make competent interpreters available during all working hours, in a number sufficient for those assistants to properly perform their assigned duties and/or exercise their delegated authority."
Sub-Clause 4.1 Contractor's General Obligations	Replace the first paragraph with the following: "The Contractor shall execute the Works in accordance with the Contract. All Contractor's Equipment, Material, and services to be incorporated in or required for the Works shall have their origin in any Eligible Country as defined by the Bank. The Contractor undertakes that the execution of the Works and the completed Works will be in accordance with the documents forming the Contract, as altered or modified by Variations, and with the Site-Specific Environment Management Plan (as per Sub-Clause 4.18) and Site-Specific Health and Safety Management Plan (as per Sub-Clause 4.8)." The following is inserted after the fourth paragraph:



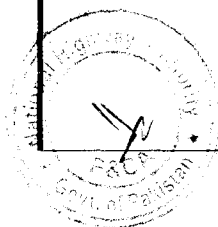
Clause/Sub-Clause	Special Provisions
	<p>“The Contractor has the obligation to notify the Employer of any changes in connection with the representations made in the Letter of Bid. If the Contractor is debarred or temporarily suspended by ADB, it shall inform the Employer of such debarment or suspension.</p> <p>The following is added as (g); and the current (g) and (h) of the Sub-Clause are then renumbered as (h) and (i) respectively.</p> <p>(g) “if so stated in the Specification, the Contractor shall:</p> <ul style="list-style-type: none"> <li>(i) design structural elements of the Works taking into account climate change considerations;</li> <li>(ii) apply the concept of universal access (the concept of universal access means unimpeded access for people of all ages and abilities in different situations and under various circumstances);</li> <li>(iii) consider the incremental risks of the public’s potential exposure to operational accidents or natural hazards, including extreme weather events; and</li> <li>(iv) any other requirement stated in the Specification.”</li> </ul>
<p>Sub-Clause 4.2.1 Contractor’s obligations</p>	<p>The first paragraph is replaced with:</p> <p>“The Contractor shall deliver the Performance Security to the Employer within 28 days after receiving the Letter of Acceptance and shall send a copy to the Engineer. The Performance Security shall be in the form of an unconditional, irrevocable, on-demand bank guarantee issued by a scheduled bank in the Country or by a foreign bank located outside the Country and counter-guaranteed by a scheduled bank in the Country to make it encashable by a bank in the Employer’s country. The Performance Guarantee shall be in the form annexed to the Particular Conditions or in another form approved by the Employer.”</p> <p>Add the following second and third paragraph:</p> <p>“In this Sub-Clause, the term ‘scheduled bank’ means any bank selected by the Contractor that is listed in the second schedule of the State Bank of Pakistan Act, 1956. The State Bank of Pakistan (SBP), which is the Country’s central bank, maintains this schedule. The second schedule includes banks that are authorized to operate in the Country and are regulated by the SBP.</p> <p>In case of Joint Venture (JV), where the term JV includes consortium or other unincorporated grouping of two or more persons, the Performance Security must be in the name of JV.”</p>
<p>Sub-Clause 4.2.2 Claims under the Performance Security</p>	<p>In the first paragraph after the words “is entitled under the Contract”, replace “in the event of” with “including in, but not limited to, the event of”.</p>
<p>Sub-Clause 4.2.3</p>	<p>In sub-paragraph (a) “21 days” is replaced with: “28 days”</p>

Clause/Sub-Clause	Special Provisions
Return of Performance Security	
Sub-Clause 4.3 Contractor's Representative	<p>The following is added at the end of second paragraph:            "The Contractor's Representative shall hold and maintain a valid "Professional Engineer" license of the Pakistan Engineering Council (PEC) or an equivalent license from the relevant regulating body in other ADB member country."</p> <p>The following is added at the end of the last paragraph: "If any of these persons is not fluent in this language, the Contractor shall make competent interpreters available during all working hours in a number that the Engineer considers to be sufficient for those persons to properly perform their delegated powers, function, and/or authority."</p> <p>"and" at the end of sub-paragraph (a) is deleted.</p> <p>"and" at the end of sub-paragraph (b) is added.</p> <p>Add the following sub-paragraph (c) after the sub-paragraph (b):            "(c) the authority to bind the Contractor and each member of the JV under Sub-Clause 1.14 [Joint and Several Liability]."</p>
Sub-Clause 4.4.1 Preparation and Review	<p>In the first paragraph, delete the word "and" at the end of sub-paragraph (c), at the end of sub-paragraph (d) replace "." with "; and" and add sub-paragraph(e) as follows:</p> <p>"(e) described in Sub-Clause 4.4.4 [Site-Specific Health and Safety Management Plan] and Sub-Clause 4.4.5 [Site-Specific Environment Management Plan]; and"</p>
Sub-Clause 4.4.3 Operation and Maintenance Manuals	<p>Delete the first paragraph and replace with:            "The operation and maintenance manuals shall be prepared by the Contractor as stated in the Specification (if not stated, as acceptable to the Engineer)."</p>
Sub-Clause 4.4.4 <sup>9</sup> Site-Specific Health and Safety Management Plan	<p>Add the following Sub-Clause:</p> <p>"The Contractor shall prepare, and keep up-to-date, the Site-Specific Health and Safety Management Plan (SSHSMP) as per Sub-Clause 4.8 [Health and Safety Obligations] showing how the Contractor will manage the health and safety risks related to the Works.</p> <p>The initial SSHSMP shall be submitted to the Engineer for Review, and no physical Works shall commence on Site until the Engineer has given (or is deemed to have given) a Notice of No-objection under sub-paragraph (i) of Sub-Clause 4.4.1 [Preparation and Review].</p>



<sup>9</sup> For projects categorized as Category C for environment for which no EMP has been prepared, this Sub-Clause should be deleted.

Clause/Sub-Clause	Special Provisions
	Thereafter, the Contractor shall update the SSHSMP at the request of the Engineer but at not less than 6- month intervals to ensure that it contains measures appropriate to the Works. The updated SSHSMP shall be submitted to the Engineer for Review as per the process outlined in Sub-Clause 4.4.1 [Preparation and Review].”
Sub-Clause 4.4.5 <sup>10</sup> Site-Specific Environment Management Plan	<p>Add the following Sub-Clause:</p> <p>“The Contractor shall prepare, and keep up-to-date, the Site-Specific Environment Management Plan (SSEMP) as per Sub-Clause 4.18 [Protection of the Environment] showing how the Contractor will manage the environment risks and impacts related to the Works (e.g., excavation, earth works, bridge and structure works, stream and road diversions, quarrying or extraction of materials, concrete batching, and asphalt manufacture).</p> <p>The initial SSEMP shall be submitted to the Engineer for Review, and no works shall commence on Site until the Engineer has given (or is deemed to have given) a Notice of No-objection under sub-paragraph (i) of Sub-Clause 4.4.1 [Preparation and Review].</p> <p>Thereafter, the Contractor shall update the SSEMP at the request of the Engineer but at not less than 6-month intervals to ensure that it contains measures appropriate to the Works. The updated SSEMP shall be submitted to the Engineer for Review as per the process outlined in Sub-Clause 4.4.1 [Preparation and Review].”</p>
Sub-Clause 4.6 Co-operation	<p>The following is added after the first paragraph:</p> <p>“The Contractor shall also, as stated in the Specification or as instructed by the Engineer, cooperate with and allow appropriate opportunities for the Employer’s Personnel to conduct any environmental and social assessment.”</p>
Sub-Clause 4.8 Health and Safety Obligations	<p>The following is included after deleting “and” at the end of (f) and replacing “.” with “;” at the end of (g):</p> <ul style="list-style-type: none"> <li>(h) “provide health and safety induction training of Contractor’s Personnel as appropriate and maintain training records;</li> <li>(i) actively engage the Contractor’s Personnel in promoting understanding, and methods for, the implementation of health and safety requirements, as well as in providing information to the Contractor’s Personnel, and provision of personal protective equipment without expense to the Contractor’s Personnel;</li> <li>(j) put in place workplace processes for Contractor’s Personnel to report work situations that they believe are not safe or healthy, and to remove themselves from a work situation that they have</li> </ul>



<sup>10</sup> For projects categorized as Category C for environment for which no EMP has been prepared, this Sub-Clause should be deleted.

Clause/Sub-Clause	Special Provisions
	<p>reasonable justification to believe presents an imminent and serious danger to their life or health;</p> <p>(k) ensure that Contractor's Personnel who remove themselves from such work situations shall not be required to return to work until necessary remedial action to correct the situation has been taken and Contractor's Personnel shall not be retaliated against or otherwise subject to reprisal or negative action for such reporting or removal;</p> <p>(l) subject to Sub-Clause 4.6 [Co-Operation], collaborate with the entities and Personnel under paragraph (a), (b), and (c) of Sub-Clause 4.6 [Co-Operation], in applying the health and safety requirements without prejudice to the responsibility of the relevant entities for the health and safety of their own personnel;</p> <p>(m) establish and implement a system for regular (not less than every 6th month) review of health and safety performance and the working environment and related reporting on incidents and accidents as per Sub-Clause 4.20 [Progress Reports];</p> <p>(n) establish preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks of the construction site work to the health and safety of local communities; and</p> <p>(o) conduct an awareness program concerning the risk of sexually transmitted infections (STIs) and sexually transmitted diseases (STDs) including HIV/AIDS via an approved service provider, and shall undertake such other measures as are specified in this Contract to reduce the risk of the transfer of HIV between and among the Contractor's Personnel and the local community, to promote early diagnosis and to assist affected individuals.</p> <p>Delete all the paragraphs after the first paragraph and replace with the following:</p> <p>As soon as practicable after the Contractor has been given access to, and possession of, the first part of the Site (or the whole Site, as the case may be), the Contractor shall submit to the Engineer for Review a detailed SSHSMP showing how the Contractor intends to comply with health and safety requirements prescribed in the Contract. The SSHSMP shall include measures the Contractor proposes to manage the health and safety risks and impacts related to the Works, provide site workers with safe and healthy working conditions and establish an operating system to prevent accidents, injuries, and disease. At a minimum, it shall be based on the Environment, Health, and Safety Management Plan (EHSMP) and Environment, Health, and Safety (EHS) Code of Conduct for Contractor's Personnel submitted as part of the Contractor's Tender and agreed as part of the Contract, and address requirements in the Environmental Management Plan (EMP) of the project.</p> <p>The procedures for Review of the SSHSMP and its updates shall be as described in Sub-Clause 4.4.1 [Preparation and Review].</p>

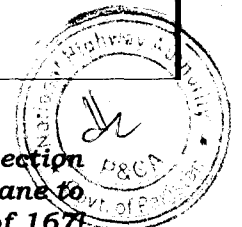




Clause/Sub-Clause	Special Provisions
	The Contractor shall, as stated in the Specification and as the Engineer may reasonably require, maintain records and make reports (in compliance with the applicable health and safety regulations and Laws) concerning the health and safety of persons and any damage to property.
Sub-Clause 4.9.1 Quality Management System	In second paragraph, delete the words "stated in the Specification (if any)" and replace with "stated in the Specification (if not stated, as acceptable to the Engineer)."
Sub-Clause 4.9.2 Compliance Verification System	In second paragraph, delete the words "stated in the Specification (if any)" and replace with "stated in the Specification (if not stated, as acceptable to the Engineer)."
Sub-Clause 4.12 Unforeseeable Physical Conditions	Please add the following subparagraph to Sub-Clause 4.12 of the GCC: In addition to notice of any Unforeseeable physical conditions, the Contractor shall provide the Engineer with a written notice of any unanticipated environmental or resettlement risks or indigenous peoples risks or impacts that arise during construction, implementation or operation of the Project, which were not considered in the initial environmental examination, the environmental management plan, SSEMP and any land acquisition resettlement plans attached hereto as Appendix [ ] through Appendix [ ].
Sub-Clause 4.13 Rights of Way and Facilities	Add the following at the end of the second paragraph:  "For any such additional facilities that the Contractor may need to obtain, the Contractor shall comply with:  (a) the measures and requirements relevant to the Contractor, which are set forth in the Resettlement Plan ("RP") attached hereto as Annex to the Particular Conditions of Contract, to the extent it concerns impacts on affected people during construction; and  (b) any corrective or preventive actions set out in safeguards monitoring reports that the Employer will prepare from time to time to monitor implementation of the Resettlement Plan.  The Accepted Contract Amount is deemed to include all expenses to ensure compliance with these measures, requirements, and actions."  The Contractor shall comply with (i) the measures and requirements relevant to the Contractor which are set forth in any of the land acquisition resettlement plans attached hereto as Appendix [ ], to the extent it concerns impacts on affected people during construction; and (ii) any corrective or preventive actions set out in safeguards monitoring reports that the Employer will prepare from time to time to monitor implementation of the resettlement plan. The Contractor shall allocate a budget for compliance with these measures, requirements and actions."
Sub-Clause 4.14	The following is inserted as a new paragraph before the second paragraph:



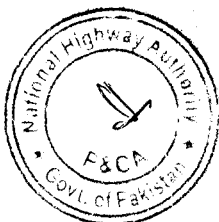
Clause/Sub-Clause	Special Provisions
Avoidance of Interference	<p>"Where such interference is necessary, the Contractor shall take all necessary measures to ensure, as far as practically possible, the uninterrupted availability of public conveniences during the execution of works. The Contractor shall coordinate with concerned local authorities before any interference with the public conveniences. In the event of any disruption or temporary closure of existing public conveniences due to the contractor's activities, the Contractor shall promptly inform the concerned local authorities, public and provide clear signage as acceptable to the Engineer. The Contractor shall minimize any inconvenience caused and take all reasonable steps to expedite the restoration of normal services. The Contractor shall appoint a designated representative responsible for addressing any public concerns or complaints related to the availability or condition of public conveniences. The contact information of the designated representative shall be prominently displayed at the construction site and made readily available to the public. The Accepted Contract Amount is deemed to include all expenses to ensure compliance with this Sub-Clause"</p>
Sub-Clause 4.15 Access Route	<p>The following is added at the end of Sub-Clause 4.15:</p> <p>"The Contractor shall take all necessary safety measures to avoid the occurrence of incidents and injuries to any third party, associated with the use of, if any, the Contractor's Equipment on access routes and other public roads or other infrastructure.</p> <p>The Contractor shall monitor road safety incidents and accidents to identify safety issues and establish and implement necessary measures to resolve them.</p> <p>The Contractor shall adequately record the condition of roads, agricultural land adjacent to access route and other infrastructure prior to the start of transporting Goods.</p> <p>The Contractor shall be liable for the reinstatement of all such access routes, agricultural land, and other public roads and infrastructure to the extent any such damages were caused by the Contractor. "</p>
Sub-Clause 4.16 Transport of Goods	<p>In sub-paragraph (c), after the word "permits", add "taxes, duties".</p> <p>The following is added at the end of this Sub-Clause:</p> <p>"The Contractor shall adequately record the condition of roads, agricultural land and other infrastructure prior to the start of transporting materials, goods and equipment, and construction."</p>
Sub-Clause 4.18 Protection of the Environment	<p>Sub-Clause 4.18 [Protection of the Environment] is replaced with:</p> <p>"The Contractor shall take all necessary measures to fulfill the following obligations under the Contract to protect the environment, including (but not limited to):</p>



Clause/Sub-Clause	Special Provisions
	<p>(a) protect the environment (both on and off the Site); and</p> <p>(b) limit damage and nuisance to people, property, and protected areas and habitat of threatened species (if any) resulting from pollution, noise, and other results of the Contractor's operations and/or activities.</p> <p>The Contractor shall ensure that emissions, surface discharges, effluent, and any other pollutants from the Contractor's activities shall exceed neither the values indicated in the Specification, nor those prescribed by applicable Laws.</p> <p>In the event of damage to the environment, property, and/or nuisance to people, on or off Site as a result of the Contractor's operations, the Contractor shall agree with the Engineer the appropriate actions and time scale to remedy, as practicable, the damaged environment to its former condition. The Contractor shall implement such remedies at its cost to the satisfaction of the Engineer.</p> <p>As soon as practicable after the Contractor has been given access to, and possession of, the first part of the Site (or the whole Site, as the case may be), the Contractor shall submit to the Engineer for Review a detailed Site-Specific Environment Management Plan (SSEMP) which has been specifically prepared for the Works, the Site and other places (if any) where the Contractor intends to execute the Works.</p> <p>The SSEMP shall include measures the Contractor proposes to manage the environmental risks and impacts of the Works. At a minimum, it shall be based on the EHSMP and EHS Code of Conduct for Contractor's Personnel submitted as part of the Contractor's Tender and agreed as part of the Contract, and address requirements in the EMP of the project.</p> <p>The SSEMP shall be in addition to any other similar document required under applicable environmental regulations and Laws, and shall set out all the requirements for the protection of the environment that:</p> <ul style="list-style-type: none"> <li>(i) are stated in the Specification; and</li> <li>(ii) comply with all the Contractor's environmental obligations under the Contract.</li> </ul> <p>The procedures for Review of the SSEMP shall be as described in Sub-Clause 4.4.1 [Preparation and Review].</p> <p>Add the following provisions:</p> <ul style="list-style-type: none"> <li>(i) The Contractor will appoint an Environmental Officer to be the primary point of contact for all matters relating to environmental management.</li> <li>(ii) The Contractor will allocate the budget required to ensure that mitigation measures are carried out.</li> </ul>

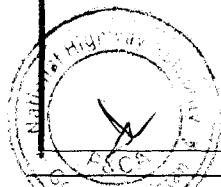


Clause/Sub-Clause	Special Provisions
	<p>(iii) The Contractor will submit monthly reports on environmental performance of the project to the Engineer.</p> <p>(iv) The Contractor will have a system for recording and communicating any complaints received by any person employed by or contracted to the Contractor. All complaints will be communicated in writing to the Engineer within one working day of their receipt.</p> <p>The Contractor shall comply with all applicable national, provincial, and local environmental laws and regulations.</p> <p>The Contractor shall (a) establish an operational system for managing environmental impacts, (b) carry out all of the monitoring and mitigation measures relevant to the Contractor set forth in [the Initial environmental examination and, the environmental management plan attached hereto as Appendix ], and (c) allocate the budget to ensure that such measures are carried out. The Contractor shall submit [quarterly][semi-annual] reports on the carrying out of such measures to the Employer.</p> <p>More particularly, the Contractor shall comply with (i) the measures and requirements set forth in the initial environmental examination, the environmental management plan and SSEMP attached hereto as Appendix-[A]; and (ii) any corrective or preventative actions set out in safeguards monitoring reports that the Employer will prepare from time to time to monitor implementation of the initial environmental examination, the environmental management plan and SSEMP.</p> <p>The Contractor shall allocate a budget for compliance with these measures, requirements and actions.”</p>



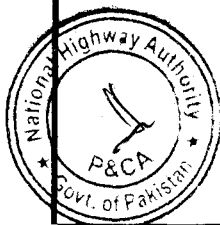
Clause/Sub-Clause	Special Provisions
<p>Sub-Clause 4.20 Progress Reports</p>	<p>Replace 4.20 (g) with: "the Environmental, Health and Safety (EHS) Metrics for Progress Reports set out in Particular Conditions - Part D"</p> <p>The following is added at the end of the Sub-Clause:</p> <p>"In addition to the reporting requirement of this sub-paragraph (g) of Sub-Clause 4.20 [Progress Reports] upon becoming aware of its occurrence, the Contractor shall inform the Engineer within 24 hours of any allegation, incident or accident, which has or is likely to have a significant adverse effect on the environment, the affected communities, the public, Employer's Personnel or Contractor's Personnel. This includes, but is not limited to, any incident or accident-causing fatality or serious injury; significant adverse effects or damage to private property or to the natural environment, including protected areas and habitat of threatened species.</p> <p>The Contractor, upon becoming aware of the incident or accident, shall also inform the Engineer within 24 hours of any such incident or accident on the Subcontractors' or suppliers' premises relating to the Works that has or is likely to have a significant adverse effect on the environment, the affected communities, the public, Employer's Personnel or Contractor's, its Subcontractors' and suppliers' personnel.</p> <p>The notification shall provide sufficient detail regarding such incidents or accidents. The Contractor shall provide full details of such incidents or accidents to the Engineer within the timeframe outlined in the SSEMP and SSHSMP or as agreed with the Engineer.</p> <p>The Contractor shall require its Subcontractors and suppliers to notify the Contractor of any incidents or accidents referred to in this Sub-Clause within the timeframe outlined in the SSEMP and SSHSMP or as agreed with the Engineer."</p> <p>Add the following as subparagraphs to Sub-Clause 4.21 of the GCC: "(i) monitoring of the obligations in Sub-Clauses [4.13, 4.18, 6.4, 6.7, 6.20, 6.21, 6.23 and 6.24.]"</p>
<p>Sub-Clause 4.21 Security of the Site</p>	<p>At the end of Sub-Clause 4.21 the following paragraphs are added:</p> <p>"If required in the Specification, further to conducting a site security risk assessment, the Contractor shall submit for the Engineer's No-objection a security management plan that sets out the security arrangements for the Site.</p> <p>The Contractor shall (i) conduct appropriate background checks on any personnel retained to provide security; (ii) train the security personnel adequately (or determine that they are properly trained) in the use of force (and where applicable, firearms), and appropriate conduct towards Contractor's Personnel, Employer's Personnel and affected communities;</p>

Clause/Sub-Clause	Special Provisions
	<p>and (iii) require the security personnel to act within the applicable Laws and any requirements set out in the Specification.</p> <p>The Contractor shall not permit any use of force by security personnel in providing security except when used for preventive and defensive purposes in proportion to the nature and extent of the threat.</p> <p>In making security arrangements, the Contractor shall also comply with any additional requirements stated in the Specification including compliance with the standing operating procedure (SOP) for security of foreign nationals working on non-CPEC projects in Pakistan issued by the Ministry of Interior, Government of Pakistan (No. 2/14/2022-CPEC; dated: 6th July 2022). The Accepted Contract Amount is deemed to include all expenses to ensure compliance with this Sub-Clause.”</p>
Sub-Clause 4.22 Contractor's Operations on Site	On the third line of the second paragraph before “4.17”, “Sub- Clause” is added.
Sub-Clause 4.23 Archaeological and Geological Findings	<p>The first paragraph is replaced with the following:</p> <p>“All fossils, coins, articles of value or antiquity, structures, groups of structures, and other remains or items of geological, archaeological, paleontological, historical, architectural, or religious interest found on the Site shall be placed under the care and custody of the Employer. The Contractor shall:</p> <ul style="list-style-type: none"> <li>a. take all reasonable precautions, including fencing-off the area or site of the finding, to avoid further disturbance and prevent Contractor's Personnel or other persons from removing or damaging any of these findings;</li> <li>b. train relevant Contractor's Personnel on appropriate actions to be taken in the event of such findings; and</li> <li>c. implement any other action consistent with the requirements of the Specification and relevant Laws.”</li> </ul>
Sub-Clause 4.24 <sup>11</sup> Environment, Health, and Safety Code of Conduct	<p>New Sub-Clause 4.24 is added as following:</p> <p>“The Contractor shall adhere to the EHS Code of Conduct for the Contractor's Personnel submitted as part of the Contractor's Tender.</p> <p>The Contractor shall take all necessary measures to ensure that each Contractor's Personnel is made aware of the of EHS Code of Conduct including specific behaviors that are prohibited and understands the consequences of engaging in such prohibited behaviors.</p>

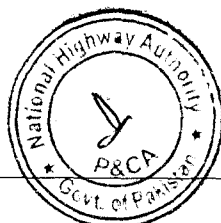


<sup>11</sup> For projects categorized as Category C for environment for which no EMP has been prepared, the last paragraph should be deleted.

Clause/Sub-Clause	Special Provisions
	<p>These measures include providing instructions and documentation that can be understood by the Contractor's Personnel and seeking to obtain, as part of the site induction training, that person's signature acknowledging receipt of such instructions and/or documentation, as appropriate. The Contractor shall keep record of such acknowledgement of receipt.</p> <p>The Contractor shall also ensure that the EHS Code of Conduct is visibly displayed in multiple locations on the Site and any other place where the Works will be carried out, as well as in areas outside the Site accessible to the local community and project affected people. The posted EHS Code of Conduct shall be provided in languages comprehensible to Contractor's Personnel, Employer's Personnel, and the local community.</p> <p>The Contractor's SSEMP (as per Sub-Clause 4.8 [Health and Safety Obligations] and SSHSMP (as per Sub-Clause 4.18 [Protection of the Environment] shall include appropriate processes for the Contractor to verify compliance with these obligations."</p>
Sub-Clause 5.1 Subcontractors	<p>The following is added at the end of the third paragraph of Sub-Clause 5.1:</p> <p>"When requesting such a prior consent, the Contractor shall submit, in addition to any other required document, an undertaking from each proposed Subcontractor to confirm that they have read, understand and shall comply with the EHS obligations set out in Sub-Clause 4.24 and EHS Code of Conduct.</p> <p>The following is added at the end of the last paragraph of Sub-Clause 5.1: The Contractor shall ensure that the requirements imposed on the Contractor by Sub-Clause 1.12 [Confidentiality] apply equally to each Subcontractor.</p> <p>Where practicable, the Contractor shall give fair and reasonable opportunity for contractors from the Country to be appointed as Subcontractors.</p> <p>All subcontracts relating to the Works shall include provisions which entitle the Employer to require the subcontract to be assigned to the Employer under sub-paragraph (a) of Sub-Clause 15.2.3 [After Termination]."</p>
Sub-Clause 5.2.2 Objection to Nomination	<p>In sub-paragraph (c):</p> <p>"and" is deleted from the end of (i);</p> <p> "." at the end of (ii) is replaced with: ", and".</p> <p>The following is then added as (iii):</p> <p>"(iii) be paid only if and when the Contractor has received from the Employer payments for sums due under the Subcontract referred to under Sub-Clause 5.2.3 [Payment to nominated Subcontractors]."</p>



Clause/Sub-Clause	Special Provisions
Sub-Clause 6.1 Engagement of Staff and Labor	<p>The following paragraphs are added at the end of the Sub-Clause:</p> <p>“The Contractor shall provide the Contractor’s Personnel information and documentation that are clear and understandable regarding their terms and conditions of employment. The information and documentation shall set out their rights under relevant labor Laws applicable to the Contractor’s Personnel (which will include any applicable collective agreements), including their rights related to hours of work, wages, overtime, compensation and benefits, as well as those arising from any requirements in the Specification. The Contractor’s Personnel shall be informed when any material changes to their terms or conditions of employment occur.</p> <p>The Contractor is encouraged, to the extent practicable and reasonable, to employ staff and labor with appropriate qualifications and experience from sources within the Country.”</p>
Sub-Clause 6.2 Rates of Wages and Conditions of Labor	<p>The following paragraphs are added:</p> <p>“The Contractor shall inform the Contractor’s Personnel about their liability to pay personal income taxes in the Country in respect of such of their salaries, wages, allowances, and any benefits as are subject to tax under the Laws of the Country for the time being in force, and the Contractor shall perform such duties in regard to such deductions thereof as may be imposed on him by such Laws.</p>
Sub-Clause 6.5 Working Hours	<p>The following is inserted at the end of the Sub-Clause:</p> <p>“The Contractor shall provide the Contractor’s Personnel annual holiday and sick, maternity, and family leave, as required by applicable Laws or as stated in the Specification.”</p> <p>“The Contractor shall have paid its staff and labor all due wages and entitlements on or before the end of their engagement or employment.”</p>
Sub-Clause 6.6 Facilities for Staff and Labor	<p>The following is added as the last paragraph:</p> <p>“If stated in the Specification, the Contractor shall give access to or provide services that accommodate the physical, social, and cultural needs of the Contractor’s Personnel. The Contractor shall also provide similar facilities for the Employer’s Personnel as stated in the Specification.”</p>
Sub-Clause 6.7 Health and Safety of Personnel	<p>In the second paragraph, “The Contractor” is replaced with:</p> <p>“Except as otherwise stated in the Specification, the Contractor...”</p> <p>The following is added after the third paragraph:</p> <p><b>HIV/AIDS Prevention.</b> The Contractor shall conduct an HIV/AIDS awareness program via an approved service provider and shall undertake such other measures as are specified in this Contract to reduce the risk of</p>

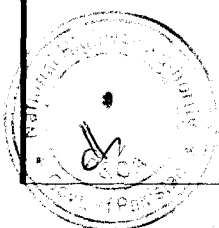




Clause/Sub-Clause	Special Provisions
	<p>the transfer of the virus between and among the Contractor's Personnel and the local community, to promote early diagnosis and to assist affected individuals.</p> <p>The Contractor shall conduct health and safety programs for workers employed under the project and shall include information on the trafficking of workers and the risk of sexually transmitted diseases, including HIV/AIDS, in such programs.</p> <p>The Contractor shall, throughout the contract (including the Defects Notification Period): (i) conduct information, education, and communication (IEC) campaigns, at least every other month, addressed to all the Site staff and labor (including all the Contractor's employees, all Subcontractors, and any other Contractor's or Employer's personnel, and all truck drivers and crew making deliveries to the Site for construction activities) and to the immediate local communities, concerning the risks, dangers and impact, and appropriate avoidance behavior with respect to, sexually transmitted diseases (STDs) or sexually transmitted infections (STIs) in general and HIV/AIDS in particular; (ii) provide male or female condoms for all Site staff and labor as appropriate; and (iii) provide for STIs and HIV/AIDS screening, diagnosis, counselling, and referral to a dedicated national STIs and HIV/AIDS program, (unless otherwise agreed) of all Site staff and labor.</p> <p>The Contractor shall include in the program to be submitted for the execution of the Works under Sub-Clause 8.3 an alleviation program for Site staff and labor and their families in respect of STIs and STDs including HIV/AIDS. The STIs, STDs, and HIV/AIDS alleviation program shall indicate when, how, and at what cost the Contractor plans to satisfy the requirements of this Sub-Clause and the related specification. For each component, the program shall detail the resources to be provided or utilized and any related subcontracting proposed. The program shall also include provision of a detailed cost estimate with supporting documentation. Payment to the Contractor for preparation and implementation this program shall not exceed the Provisional Sum dedicated for this purpose.</p>
Sub-Clause 6.9 Contractor's Personnel	<p>The Sub-Clause is replaced with:</p> <p>"The Contractor's Personnel (including Key Personnel, if any) shall be appropriately qualified, skilled, experienced, and competent in their respective trades or occupations.</p> <p>The Engineer may require the Contractor to remove (or cause to be removed) any person employed on the Site or Works, including the Contractor's Representative and Key Personnel (if any), who:</p> <ol style="list-style-type: none"> <li>a) persists in any misconduct or lack of care;</li> <li>b) carries out duties incompetently or negligently;</li> <li>c) fails to comply with any provision of the Contract;</li> <li>d) persists in any conduct which is prejudicial to safety, health, or the protection of the environment;</li> </ol>

Clause/Sub-Clause	Special Provisions
	<p>e) based on reasonable evidence, is determined to have engaged in any of the conducts defined in 2.1 (a) of Particular Conditions Part C (Corrupt and Fraudulent Practices) during the execution of the Works;</p> <p>f) has been recruited from the Employer's Personnel in breach of Sub-Clause 6.3 [Recruitment of Persons]; and</p> <p>g) undertakes behavior that breaches the EHS Code of Conduct for Contractor's Personnel as stated in Sub-Clause 4.24 [EHS Code of Conduct].</p> <p>If appropriate, the Contractor shall then promptly appoint (or cause to be appointed) a suitable replacement with equivalent skills and experience. In the case of replacement of the Contractor's Representative, Sub-Clause 4.3 [Contractor's Representative] shall apply. In the case of replacement of Key Personnel (if any), Sub-Clause 6.12 [Key Personnel] shall apply.</p> <p>Subject to the requirements in Sub-Clause 4.3 [Contractor's Representative] and 6.12 [Key Personnel], and notwithstanding any requirement from the Engineer to remove or cause to remove any person, the Contractor shall take immediate action as appropriate in response to any violation of (a) through (g) above. Such immediate action shall include removing (or causing to be removed) from the Site or other places where the Works are being carried out, any Contractor's Personnel who engages in (a), (b), (c), (d), (e), or (g) above or has been recruited as stated in (f) above."</p>
Sub-Clause 6.12 Key Personnel	<p>The following is inserted at the end of the last paragraph:</p> <p>"If any of the Key Personnel are not fluent in this language, the Contractor shall make competent interpreters available during all working hours in a number deemed sufficient by the Engineer."</p>
	<p><b>The following Sub-Clauses 6.13 to 6.28 are added after Sub-Clause 6.12</b></p>
Sub-Clause 6.13 Foreign Personnel	<p>The Contractor may bring into the Country any foreign personnel who are necessary for the execution of the Works to the extent allowed by the applicable Laws. The Contractor shall ensure that these personnel are provided with the required residence visas and work permits. The Employer will, if requested by the Contractor, use its best endeavors in a timely and expeditious manner to assist the Contractor in obtaining any local, state, national, or government permission required for bringing in the Contractor's personnel.</p> <p>The Contractor shall be responsible for the return of these personnel to the place where they were recruited or to their domicile. In the event of the death in the Country of any of these personnel or members of their families, the Contractor shall similarly be responsible for making the appropriate arrangements for their return or burial.</p>
Sub-Clause 6.14 Supply of Foodstuffs	<p>The Contractor shall arrange for the provision of a sufficient supply of suitable food as may be stated in the Specification at reasonable prices for</p>

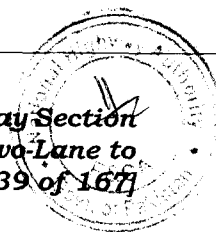
Clause/Sub-Clause	Special Provisions
	the Contractor's Personnel for the purposes of or in connection with the Contract.
Sub-Clause 6.15 Supply of Water	The Contractor shall, having regard to local conditions, provide on the Site an adequate supply of drinking and other water for the use of the Contractor's Personnel.
Sub-Clause 6.16 Measures against Insect and Pest Nuisance	The Contractor shall, at all times, take the necessary precautions to protect the Contractor's Personnel employed on the Site from insect and pest nuisance, and to reduce the danger to their health. The Contractor shall comply with all the regulations of the local health authorities, including on the use of appropriate insecticide.
Sub-Clause 6.17 Alcoholic Liquor or Drugs	The Contractor shall not, otherwise in accordance with the Laws of the Country, import, sell, give, barter, or dispose of any alcoholic liquor or drugs, or permit or allow importation, sale, gift, barter, or disposal thereto by the Contractor's Personnel.
Sub-Clause 6.18 Arms and Ammunition	The Contractor shall not give, barter, or dispose of, to any person, any arms or ammunition of any kind, or allow the Contractor's Personnel to do so.
Sub-Clause 6.19 Festivals and Religious Customs	The Contractor shall respect the Country's recognized festivals, days of rest, and religious or other customs including those practiced by communities adjacent to the Site. The Contractor shall take account of this Sub-Clause while preparing the initial and revised programme under Sub-Clause 8.3 [Programme].
Sub-Clause 6.20 Funeral Arrangements	The Contractor shall be responsible, to the extent required by local regulations, for making any funeral arrangements for any of its local employees who may die while engaged upon the Works.
Sub-Clause 6.21 Forced Labor	<p>The Contractor shall not employ or engage forced labor. Forced labor means all work or services not voluntarily performed, that is, extracted from individuals under threat of force or penalty.</p> <p>The Contractor shall not employ persons who have been subject to trafficking. Trafficking in persons is defined as the recruitment, transportation, transfer, harboring, or receipt of persons by means of the threat or use of force or other forms of coercion, abduction, fraud, deception, abuse of power, or of a position of vulnerability, or of the giving or receiving of payments or benefits to achieve the consent of a person having control over another person, for the purposes of exploitation.</p> <p>The Contractor shall ensure that its Subcontractors and suppliers comply with all the obligations under this Sub-Clause.</p>
Sub-Clause 6.22 Child Labor	<p>The Contractor shall not employ or engage a child whose age is below the Country's statutory minimum age of employment or a child in contravention of International Labour Organization, Convention no. 138 (Minimum Age Convention).</p> <p>The Contractor shall not employ or engage a child between the minimum age and the age of 18 in a manner that 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.</p>



Clause/Sub-Clause	Special Provisions
	<p>The Contractor shall only employ or engage children between the minimum age and the age of 18 after an appropriate risk assessment has been conducted by the Contractor with the Engineer's consent. The Contractor shall be subject to regular monitoring by the Engineer that includes monitoring of health, working conditions, and hours of work.</p> <p>Work considered hazardous for children is work that, by its nature or the circumstances in which it is carried out, is likely to jeopardize the health, safety, or morals of children. Such work activities prohibited for children include work</p> <ul style="list-style-type: none"> <li>(a) with exposure to physical, psychological, or sexual abuse;</li> <li>(b) underground, underwater, or working at heights or in confined spaces;</li> <li>(c) with dangerous machinery, equipment, or tools, or involving handling or transport of heavy loads;</li> <li>(d) in unhealthy environments exposing them to hazardous substances, agents, or processes, or to temperatures, noise, or vibration damaging to their health; or</li> <li>(e) under difficult conditions such as working for long hours, during the night, or in confinement on the premises of the employer.</li> </ul> <p>The Contractor shall ensure that its Subcontractors and suppliers comply with all the obligations under this Sub-Clause.</p>
Sub-Clause 6.23 Employment Records of Workers	<p>The Contractor shall keep complete and accurate records of the employment of labor at the Site. The records shall include the names, ages, genders, hours worked, and wages paid to all workers. These records shall be summarized on a monthly basis and submitted to the Engineer. These records shall be included in the details to be submitted by the Contractor under Sub-Clause 6.10 [Contractor's Records].</p>
Sub-Clause 6.24 Workers' Organizations	<p>In countries where the relevant labor laws recognize workers' rights to form and join workers' organizations of their choosing and to bargain collectively without interference, the Contractor shall comply with such laws. In such circumstances, the role of legally established workers' organizations and legitimate workers' representatives will be respected, and they will be provided with information needed for meaningful negotiation in a timely manner. Where the relevant labor laws substantially restrict workers' organizations, the Contractor shall enable alternative means for the Contractor's Personnel to express their grievances and protect their rights regarding working conditions and terms of employment. The Contractor shall not seek to influence or control these alternative means. The Contractor shall not discriminate or retaliate against the Contractor's Personnel who participate, or seek to participate, in such organizations and collective bargaining or alternative mechanisms. Workers' organizations are expected to fairly represent the workers in the workforce.</p>



Clause/Sub-Clause	Special Provisions
Sub-Clause 6.25 Non-Discrimination and Equal Opportunity	<p>The Contractor shall not make decisions relating to the employment or treatment of Contractor's Personnel on the basis of personal characteristics unrelated to inherent job requirements. The Contractor shall base the employment of the Contractor's Personnel on the principle of equal opportunity and fair treatment and shall not discriminate with respect to any aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, promotion, termination of employment or retirement, and disciplinary practices.</p> <p>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.</p> <p>The Contractor shall provide protection and assistance as necessary to ensure non-discrimination and equal opportunity, including for specific groups such as women, people with disabilities, indigenous peoples and/or ethnic minorities, migrant workers and children (of working age in accordance with Sub-Clause 6.22).</p>
Sub-Clause 6.26 Contractor's Personnel Grievance Mechanism	<p>The Contractor shall have a grievance mechanism for Contractor's Personnel, and where relevant, the workers' organizations stated in Sub-Clause 6.24 [Workers' Organizations], to raise workplace concerns. The grievance mechanism shall be proportionate to the nature, scale, risks, and impacts of the Contract. The mechanism shall address concerns promptly, using an understandable and transparent process that provides timely feedback to those concerned in a language they understand, without any retribution, and shall operate in an independent and objective manner.</p> <p>The Contractor's Personnel shall be informed of the grievance mechanism at the time of engagement for the Contract, and the measures put in place to protect them against any reprisal for its use. Measures will be put in place to make the grievance mechanism easily accessible to all Contractor's Personnel.</p> <p>The grievance mechanism shall not impede access to other judicial or administrative remedies that might be available or substitute for grievance mechanisms provided through collective agreements.</p> <p>The grievance mechanism may utilize existing grievance mechanisms, providing that they are properly designed and implemented, address concerns promptly, and are readily accessible to Contractor's Personnel. Existing grievance mechanisms may be supplemented as needed with Contract-specific arrangements.</p>
Sub-Clause 6.27 Training of Contractor's Personnel	<p>The Contractor shall provide appropriate training to relevant Contractor's Personnel on obligations set out in Sub-Clause 4.8 [Health and Safety Obligations], 4.18 [Protection of the Environment] and Sub-Clause 6.28 [Respectful Work Environment] respectively.</p>
Sub-Clause 6.28	<p>The following sentence shall apply:</p>

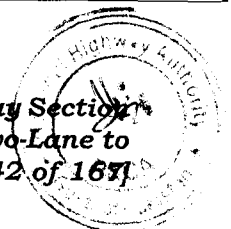


Clause/Sub-Clause	Special Provisions
Respectful Work Environment	<p>The Contractor shall ensure that its employees and Subcontractors observe the highest ethical standards and refrain from any form of bullying, discrimination, misconduct and harassment, including sexual harassment; and shall, at all times, behave in a manner that creates an environment free of unethical behavior, bullying, misconduct, and harassment, including sexual harassment. The Contractor shall take appropriate action against any employees or subcontractors, including suspension or termination of employment or subcontract, if any form of unethical or inappropriate behavior is identified.</p> <p>The Contractor shall conduct training programs for its employees and Subcontractors to raise awareness on and prevent any form of bullying, discrimination, misconduct, and harassment including sexual harassment, and to promote a respectful work environment. The Contractor shall keep an up-to-date record of its employees and Subcontractors who have attended and completed such training programs and provide such records to the Employer or the Engineer at their first written request.</p>
Sub-Clause 7.7 Ownership of Plant and Materials	<p>The following is added before the first paragraph:</p> <p>“Except as otherwise provided in the Contract,”</p> <p>Add the following paragraph at the end:</p> <p>“The Contractor shall however remain responsible for the safety, ambient or specialized storage (as required) and care of each item of Plant and Materials until the Employer’s taking over under Sub-Clause 10 [Employer’s Taking Over].”</p>
Sub-Clause 8.1 Commencement of Work	<p>The first paragraph is replaced with the following:</p> <p>“The Engineer shall give a Notice to the Contractor stating the Commencement Date, not less than 14 days before the Commencement Date. This Notice shall be issued promptly after the Engineer determines the fulfillment of the following conditions:</p> <ul style="list-style-type: none"> <li>(a) signature of the Contract Agreement by both Parties, and if required, approval of the Contract by relevant authorities of the Country;</li> <li>(b) delivery to the Contractor of reasonable evidence of the Employer’s financial arrangements (under Sub-Clause 2.4 [Employer’s Financial Arrangements];</li> <li>(c) except if otherwise specified in Sub-Clause 2.1 in the Contract Data, effective access to and possession of the Site given to the Contractor together with such permission(s) under (a) of Sub-Clause 1.13 [Compliance with Laws] as required for the commencement of the Works;</li> <li>(d) receipt by the Contractor of the Advance Payment under Sub-Clause 14.2 [Advance Payment] provided that the conditions set out under</li> </ul>



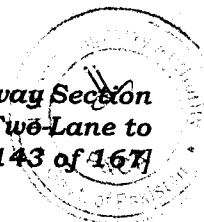
Clause/Sub-Clause	Special Provisions
	Sub-Clause 14.2.2(a) and (b) have been fulfilled by the Contractor within 28 days from the receipt of the Letter of Acceptance. Otherwise, this sub-paragraph (d) shall not apply.
Sub-Clause 8.3 Programme	<p>Replace the second sentence in the first paragraph with the following:            "This programme shall be prepared using programming software Primavera P6 or equivalent, as acceptable to the Engineer. The level of the work breakdown structure (WBS) shall be level-5, unless otherwise instructed by the Engineer."</p> <p>Add the following at the end of sub-paragraph (b):</p> <p>“, it being understood that the sequence of construction activities should take into account, to the extent possible, the constraints due to land acquisition as set out in the resettlement plan.”</p>
Sub-Clause 11.2 Cost of Remedying Defects	<p>Add the following paragraph at the end of this Sub-Clause:</p> <p>“Upon the completion of construction, the Contractor shall fully reinstate pathways, other local infrastructure, and agricultural land to at least their pre-project condition as recorded by the Contractor in consonance with its obligation in Clause 4.16.”</p> <p>To be in line with para .13 (f) of Schedule 4 of the Loan Agreement please insert the following at the end of this clause:</p> <p>Upon the completion of construction, the Contractor shall fully reinstate pathways, other local infrastructure, and agricultural land to at least their pre-project condition as recorded by the Contractor in consonance with its obligation in Clause 4.16.</p>
Sub-Clause 13.3.1 Variation by Instruction	Sub-paragraph 13.3.1 (a) is replaced with: “a description of the varied work performed or to be performed, including details of the resources and methods adopted or to be adopted by the Contractor, and sufficient information to enable an evaluation of environment, health, and safety risks and impacts;”
Sub-Clause 13.4 Provisional Sums	<p>The following is inserted as the penultimate paragraph:</p> <p>“A specific Provisional Sum for the work of the DAAB shall be used to cover the Employer's share of the DAAB members' fees and expenses, in accordance with Clause 21 [Dispute and Arbitration]. Notwithstanding the foregoing, no prior instruction of the Engineer shall be required for use of this specific Provisional Sum. The Contractor shall submit the DAAB members' invoices and satisfactory evidence of having paid 100% of such invoices as part of supporting documents of those Statements submitted under Sub-Clause 14.3 [Application for Interim Payment]. No overhead and profit shall be paid to the Contractor in respect of the Provisional Sum”.</p> <p>The following is added at the end of the first paragraph:</p>

Clause/Sub-Clause	Special Provisions
	<p>If the Bill of Quantities includes Provisional Sums for contingencies, it shall be used, in whole or part, at the discretion, and in accordance with the instructions, of the Engineer, to meet any of the Employer's payment obligations in connection with or arising out of the Contract.</p>
<p>Sub-Clause 13.6 Adjustments for Changes in Laws</p>	<p>The following paragraph is added at the end of the Sub-Clause:</p> <p>"Notwithstanding the foregoing, the Contractor shall not be entitled to an extension of time if the relevant delay has already been taken into account in the determination of a previous extension of time and such Cost shall not be separately paid if the same shall already have been taken into account in the indexing of any inputs to the Table of Adjustment Data in accordance with the provisions of Sub-Clause 13.7 [Adjustments for Changes in Cost]."</p>
<p>Sub-Clause 14.1 The Contract Price</p>	<p>The following paragraph is added at the end of the Sub-Clause:</p> <p>"Notwithstanding the provisions of sub-paragraph (b), Contractor's Equipment, including essential spare parts, imported by the Contractor for the sole purpose of executing the Contract shall be temporarily exempt from the payment of import duties and taxes upon initial importation, provided the Contractor shall post with the customs authorities at the port of entry an approved export bond or bank guarantee, valid until the Time of Completion plus 6 months, in an amount equal to the full import duties and taxes that would be payable on the assessed imported value of such Contractor's Equipment and spare parts, and callable in the event the Contractor's Equipment is not exported from the Country on completion of the Contract. A copy of the bond or bank guarantee endorsed by the customs authorities shall be provided by the Contractor to the Employer upon the importation of individual items of Contractor's Equipment and spare parts. Upon export of individual items of the Contractor's Equipment or spare parts, or upon the completion of the Contract, the Contractor shall prepare, for approval by the customs authorities, an assessment of the residual value of the Contractor's Equipment and spare parts to be exported, based on the depreciation scale(s) and other criteria used by the customs authorities for such purposes under the provisions of the applicable Laws. Import duties and taxes shall be due and payable to the customs authorities by the Contractor on (a) the difference between the initial imported value and the residual value of the Contractor's Equipment and spare parts to be exported; and (b) on the initial imported value of the Contractor's Equipment and spare parts remaining in the Country after the completion of the Contract. Upon payment of such dues within 28 days of being invoiced, the bond or bank</p>





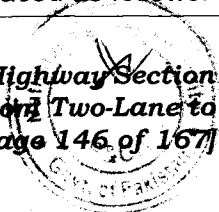
Clause/Sub-Clause	Special Provisions
	guarantee shall be reduced or released accordingly, otherwise the security shall be called in the full amount remaining."
Sub-Clause 14.2.1 Advance Payment Guarantee	The first paragraph is replaced with:  "The Contractor shall obtain (at the Contractor's cost) an Advance Payment Guarantee in amounts and currencies equal to the advance payment and shall submit it to the Employer with a copy to the Engineer. This guarantee shall be issued by reputable bank or financial institution selected by the Contractor and shall be based on the sample form annexed to the Particular Conditions or in another form agreed by the Employer (but such agreement shall not relieve the Contractor from any obligation under this Sub-Clause)."
Sub-Clause 14.3 Application for Interim Payment	Sub-paragraph (vi) is replaced with the following:  "(vi) any other additions and/or deductions that have become due under the Contract or otherwise, including those under Sub-Clause 3.7 [Agreement or Determination], any amount due to the Contractor under Sub-Clause 21.4.3 (i) and any reimbursement due to the Contractor under Sub-Clause 9.5 of the General Conditions of the DAAB Agreement."
Sub-Clause 14.9 Release of Retention Money	The following is added at the end of Sub-Clause 14.9:  "Unless otherwise stated in the Contract, when the Taking-Over Certificate has been issued for the Works and the first half of the Retention Money has been certified for payment by the Engineer, the Contractor shall be entitled to substitute a guarantee, in the form annexed to the Particular Conditions or in another form approved by the Employer and issued by a reputable bank or financial institution selected by the Contractor, for the second half of the Retention Money. The Contractor shall ensure that the guarantee is in the amounts and currencies of the second half of the Retention Money and is valid and enforceable until the Contractor has executed and completed the Works and remedied any defects, as specified for the Performance Security under Sub-Clause 4.2. On receipt by the Employer of the required guarantee, the Engineer shall certify and pay the second half of the Retention Money. The release of the second half of the Retention Money against a guarantee shall then be in lieu of the release after the latest of the expiry dates of the Defects Notification Periods. The Employer shall return the guarantee to the Contractor within 21 days after receiving a copy of the Performance Certificate.  If the Performance Security required under Sub-Clause 4.2 is in the form of a demand guarantee, and the amount guaranteed under it when the Taking-Over Certificate is issued is more than half of the Retention Money, then the Retention Money guarantee will not be required. If the amount guaranteed under the Performance Security, when the Taking-Over Certificate is issued is less than half of the Retention Money, the Retention Money guarantee will only be required for the difference between half of the Retention Money and the amount guaranteed under the Performance Security."



Clause/Sub-Clause	Special Provisions
Sub-Clause 14.15 Currencies of Payment	Throughout Sub-Clause 14.15, "Contract Data" is replaced with:  "Schedule of Payment Currencies or the Bill of Quantities (in case the use of various currencies is stated in the Bill of Quantities itself), as applicable".
Sub-Clause 15.1 Notice to Correct	"and" is deleted at the end of (b) and "." is replaced by: "; and" in (c).  The following is then added as (d):  "(d) specify the time within which the Contractor shall respond to the Notice to Correct."  In the third paragraph, "shall immediately respond" is replaced with: "shall respond within the time specified in (d)".  Further, at the end of the third paragraph, "to comply with the time specified in the Notice to Correct." is replaced with: "to comply with the time specified in (c)."
Sub-Clause 15.2.1 Notice	Sub-paragraph (h) is replaced with: "is found, based on reasonable evidence, to have engaged in Corrupt and Fraudulent Practices as defined in Paragraph 2.1 (a) of Part C of the Particular Conditions [Corrupt and Fraudulent Practices], in competing for or in executing the Contract."  The following new sub-paragraph (i) is added:  (i) flagrantly and persistently fails to implement and comply with the approved SSHSMP and/or EMP under Sub-Clause 4.8 [Health and Safety Obligations]."
Sub-Clause 15.8 Fraud and Corruption	The following new Sub-Clause is added:  "15.8.1 The Bank requires compliance with the Bank's Anticorruption Policy and Integrity Principles and Guidelines (both as amended from time to time), as set forth in Particular Conditions - Part C- Corrupt and Fraudulent Practices.  15.8.2 The Employer requires the Contractor to disclose any commissions, gratuities, or fees that may have been paid or are intended to be paid to agents or any other party with respect to the bidding process or execution of the Contract. The information disclosed must include at least the name and address of the agent or other party, the amount and currency, and the purpose of the commission, gratuity, or fee."
Sub-Clause 16.2.1 Notice	At the end of sub-paragraph (i): "; or" is replaced with: "." sub-paragraph (f) is replaced with: "(f) the Contractor does not receive a Notice of the Commencement Date under Sub-Clause 8.1 [Commencement of Works] within 182 days after receiving the Letter of Acceptance, for reasons not attributable to the Contractor;"

Clause/Sub-Clause	Special Provisions
	Sub-paragraph (j) is replaced with: "the Employer is found, based on reasonable evidence, in accordance with the Bank's Anticorruption Policy and Integrity Principles and Guidelines (both as amended from time to time) to have incurred in integrity violations, such as those defined in Part C [Corrupt and Fraudulent Practices] of the Particular Conditions of Contract at any time in relation to work or the Contract."
Sub-Clause 16.2.2 Termination	The following is added at the end of Sub-Clause 16.2.2:  "In the event the Bank suspends the loan or grant from which part or whole of the payments to the Contractor are being made, if the Contractor has not received the sums due to him by the expiry of 14 days after the relevant time period referred to in Sub-Clause 14.7 [Payment], issuance of the Interim Payment Certificates to which they relate, the Contractor may, without prejudice to the Contractor's entitlement to financing charges under Sub-Clause 14.8 [Delayed Payment], take one of the following actions: (i) suspend work or reduce the rate of work under Sub-Clause 16.1 above, or (ii) terminate the Contract by giving Notice to the Employer, with a copy to the Engineer, such termination to take effect 14 days after giving the Notice."
Sub-Clause 17.7 Use of Employer's Accommodation/Fa- cilities	The following Sub-Clause is added as 17.7:  "The Contractor shall take full responsibility for the care of the Employer-provided accommodation and facilities, if any, as detailed in the Specification, from the respective dates of hand over to the Contractor until cessation of occupation (where hand over or cessation of occupation may take place after the date stated in the Taking-Over Certificate for the Works).  If any loss or damage happens to any of the above items while the Contractor is responsible for their care arising from any cause whatsoever other than those for which the Employer is liable, the Contractor shall, at its own cost, rectify the loss or damage to the satisfaction of the Engineer."
Sub-Clause 18.1 Exceptional Events	"Sub-paragraph (c) is substituted with  (c) riot, commotion, disorder, or sabotage by persons other than the Contractor's Personnel and other employees of the Contractor and Subcontractors;"
Sub-Clause 18.4 Consequences of an Exceptional Event	The following is added at the end of sub-paragraph (b) after deleting the ".": ", including the costs of rectifying or replacing the Works and/or Goods damaged or destroyed by Exceptional Events, to the extent they are not indemnified through the insurance policy referred to in Sub-Clause 19.2 [Insurance to be provided by the Contractor]."
Sub-Clause 18.5 Optional Termination	In sub-paragraph (c), "and necessarily" is inserted after "was reasonably".

Clause/Sub-Clause	Special Provisions
Sub-Clause 19.1 General Requirements	The following paragraphs are added after the first paragraph:  "Wherever the Employer is the insuring Party, each insurance shall be effected with insurers and in terms acceptable to the Contractor. These terms shall be consistent with terms (if any) agreed by both Parties before the date of the Letter of Acceptance.  This agreement of terms shall take precedence over the provisions of this Clause.
Sub-Clause 19.2 insurance to be provided by the Contractor	The following is inserted as the first sentence in Sub-Clause 19.2:  "The Contractor shall be entitled to place all insurances relating to the Contract (including, but not limited to the insurance referred to in Clause 19) with insurers from the List of Eligible Countries as stated in Sub-Clause 1.5."
Sub-Clause 19.2.5 Injury to employees	The second paragraph is replaced with:  "The Employer and the Engineer shall also be indemnified under the policy of insurance, against liability for claims, damages, losses, and expenses (including legal fees and expenses) arising from injury, sickness, disease, or death of any person employed by the Contractor or any other of the Contractor's Personnel, except that this insurance may exclude losses and claims to the extent that they arise from any act or neglect of the Employer or of the Employer's Personnel."
Sub-Clause 20.1 Claims	In a): "any additional payment" is replaced with "any payment".
Sub-Clause 20.2 Claims for Payment and/or EOT	The first paragraph is replaced with:  "If either Party considers that it is entitled to claim under Sub-Clause 20.1 (a) or (b), the following claim procedure shall apply:"
Sub-Clause 20.2.7 General requirements	In the first paragraph, replace "until" with "after" and delete "reasonably".
Sub-Clause 21.1 Constitution of the DAAB	First paragraph: the second sentence is replaced with: "The Parties shall jointly appoint the member(s) of the DAAB within 28 days after the Commencement Date, unless stated otherwise in the Contract Data."  In the second paragraph, at the end of the first sentence after deleting: ".", the following is added: ", each of whom shall meet the criteria set forth in Sub-Clause 3.3 of Appendix- General Conditions of Dispute Avoidance/ Adjudication Agreement."  After the second paragraph insert the following paragraph: "If the Contract is with a foreign Contractor, the third member (Chairman) of DAAB shall not have the same nationality as the Employer or the Contractor."
Sub-Clause 21.4.3	Item (i) of penultimate paragraph is deleted and replaced as follows:



Clause/Sub-Clause	Special Provisions
The DAAB's decision	(i) subject to sub-paragraph (ii) below, this amount shall be due and payable in the next Payment Certificate, for which the Engineer is obliged to certify, and the Employer is obliged to make payment; and
Sub-Clause 21.6 Arbitration	<p>In the first paragraph, delete starting from: "international arbitration" up to the end of (c), and replace with the following:  "arbitration. Arbitration shall be conducted as follows:</p> <p>(a) If the Contractor, or if the leader of the Joint Venture in case the Contractor is a Joint Venture, is from outside the Country, unless otherwise specified in the Contract Data:</p> <p>(i) the Dispute shall be finally settled under the Rules of Arbitration of the Singapore International Arbitration Centre (SIAC), with proceedings administered by SIAC;</p> <p>(ii) the Dispute shall be settled by one or three arbitrators appointed in accordance with these Rules; and</p> <p>(iii) the place of arbitration shall be Singapore or any other neutral place mutually agree by both the Employer and the Contractor.</p> <p>The arbitration shall be conducted in the ruling language defined in Sub-Clause 1.4 [Law and Language].</p> <p>(b) If the Contract is with domestic contractors, arbitration with proceedings conducted in accordance with the laws of the Employer's country."</p>
<b>APPENDIX- GENERAL CONDITIONS OF DISPUTE AVOIDANCE/ADJUDICATION AGREEMENT</b>	
1. Definitions	In Sub-Clause 1.8 a(i):" authorized representative of the Contractor or of the Employer" is replaced with: "Contractor's Representative or authorized representative of the Employer".
2. General Provisions	Sub-Clause 2.2 is deleted in its entirety.
7. Confidentiality	<p>In Sub-Clause 7.3: "or" is deleted from the end of sub-paragraph (b); "." at the end of sub-paragraph (c) is replaced with: ", or".</p> <p>The following is then added as (d):  "(d) is required by the Bank."</p>
10. Resignation and Termination	In Sub-Clause 10.3: "the DAA Agreement" is replaced with: "a DAAB member's DAAB Agreement".



# Part C – Corrupt and Fraudulent Practices

## 1. Purpose

1.1 ADB's Anticorruption Policy and Integrity Principles and Guidelines (both as amended from time to time) and this annex apply with respect to procurement under ADB-financed activities.

## 2. Requirements

2.1 ADB requires Borrowers (including beneficiaries of ADB-financed activity) and their personnel, as well as firms and individuals participating in an ADB-financed activity, including but not limited to, Bidders, Suppliers and Contractors, agents, subcontractors, subconsultants, service providers, subsuppliers, manufacturers (including their respective officers, directors, employees and personnel) under ADB-financed contracts to observe the highest standard of ethics during the procurement and execution of such contracts in accordance with ADB's Anticorruption Policy (1998, as amended from time to time). In pursuance of this policy, ADB

(a) defines, for the purposes of this provision, the terms set forth below as follows:

- (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) "abuse" means theft, waste, or improper use of assets related to ADB-related activity, either committed intentionally or through reckless disregard;
- (vi) "conflict of interest" means any situation in which a party has interests that could improperly influence that party's performance of official duties or responsibilities, contractual obligations, or compliance with applicable laws and regulations;
- (vii) "integrity violation" means any act, as defined under ADB's Integrity Principles and Guidelines (2015, as amended from time to time), which violates ADB's Anticorruption Policy, including (i) to (vi) above and the following: obstructive practice, violations of ADB sanctions, retaliation against whistleblowers or witnesses, and other violations of ADB's Anticorruption Policy, including failure to adhere to the highest ethical standards.

(b) will reject a proposal for award if it determines that the Bidder recommended for award or any of its officers, directors, employees, personnel, subconsultants, subcontractors, service providers, suppliers or manufacturers 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) will cancel the portion of the financing allocated to a contract if it determines at any time that representatives of the Borrower or of a beneficiary of ADB financing engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations during the procurement or the execution of that contract, without the Borrower having taken timely and

appropriate action satisfactory to ADB to remedy the situation, including by failing to inform ADB in a timely manner at the time they knew of the integrity violations;

- (d) will impose remedial actions on a firm or an individual at any time, in accordance with ADB's Anticorruption Policy and Integrity Principles and Guidelines, including declaring ineligible, either indefinitely or for a stated period of time, to participate<sup>12</sup> in activities financed, administered, or supported by ADB or to benefit from a contract financed, administered, or supported by ADB 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) will have the right to require that a provision be included in bidding documents and in contracts financed, administered, or supported by ADB, requiring Bidders, suppliers, contractors, consultants, manufacturers, service providers and other third parties engaged or involved in ADB-related activities, and their respective officers, directors, employees and personnel, to permit ADB or its representative to inspect the site and their assets, accounts and records and other documents relating to the bid submission and contract performance and to have them audited by auditors appointed by ADB.

2.2 All Bidders, consultants, contractors, suppliers, manufacturers, service providers, and other third parties engaged or involved in ADB-related activities and their respective officers, directors, employees and personnel, are required to cooperate fully in any investigation when requested by ADB to do so. As determined on a case-by-case basis by ADB, such cooperation is set out in detail in the Integrity Principles and Guidelines.

2.3 All Bidders, consultants, contractors and suppliers shall require their officers, directors, employees, personnel, agents to ensure that, in its contracts with its subconsultants, Subcontractors, and other third parties engaged or involved in ADB-related activities, such subconsultants, Subcontractors, and other third parties similarly are required to cooperate fully in any investigation when requested by ADB to do so.

2.4 The Contractor undertakes that no fees, gratuities, rebates, gifts, commissions or other payments, other than those shown in the bid, have been given or received in connection with the procurement process or in the contract execution.<sup>13</sup>

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<sup>12</sup> Whether as a Contractor, Subcontractor, Consultant, Manufacturer or Supplier, or Service Provider; or in any other

capacity (different names are used depending on the particular Bidding Document).

<sup>13</sup> The undertaking also applies during the period of performance of the contract.

# Part D- Environmental, Health and Safety (EHS)

## Metrics for Progress Reports

*Metrics for regular reporting:*

### **a. Incidents for Non-Conformance**

- (i) Environmental incidents or non-conformance with contract requirements, including contamination, pollution, or damage to ground or water supplies
- (ii) Health and safety incidents, accidents, injuries that require treatment, and all fatalities
- (iii) Interactions with regulators: identify agency, dates, subjects, outcomes (report the negative if none)

### **b. Status of All Permits and Agreements:**

- (i) Work permits: number required, number received, and actions taken for those not received
- (ii) Status of permits and consents:
  - (a) List areas and facilities with permits required (quarries, asphalt, and batch plants), dates of application, dates issued (actions to follow up if not issued), dates submitted to resident engineer (or equivalent), and status of area (waiting for permits, working, abandoned without reclamation, decommissioning plan being implemented, etc.).
  - (b) List areas with landowner agreements required (borrow and spoil areas, camp sites), dates of agreements, and dates submitted to resident engineer (or equivalent).
  - (c) Identify and highlight major activities and environment, health, and safety activities undertaken in each area in the reporting period (land clearing, boundary marking, topsoil salvage, traffic management, decommissioning planning, decommissioning implementation).
  - (d) For quarries: indicate status of relocation and compensation (completed, or details of activities and current status in the reporting period).
  - (e) List parts of the Site for which Notice to commence work and confirmation by the Employer as per Sub-Clause 2.1 was received by the Contractor and the other parts of the Site for which such Notice is pending.

### **c. Compliance<sup>14</sup>**

- (i) Compliance status for conditions of all relevant consents and permits for the Work, including quarries, etc.: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance
- (ii) Compliance status of SSHSMP (as per Sub-Clause 4.8 [*Health and Safety Obligations*]) and SSEMP (as per Sub-Clause 4.18 [*Protection of the Environment*]): statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance
- (iii) Other unresolved issues from previous reporting periods related to environmental and social: continued violations, continued failure of equipment, continued lack of vehicle covers, spills not dealt with, continued compensation or blasting issues, etc.; cross-reference other sections as needed

### **d. Supervision**

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<sup>14</sup> For projects categorized as Category C for environment for which no EMP has been prepared, the item (ii) should be deleted.



- (i) Environmental Supervision
  - (a) Environmental specialist: number of days worked, areas inspected, number of inspections of each (road section, work camp, accommodations, quarries, borrow areas, spoil areas, swamps, forest crossings, etc.), highlights of activities and findings (including violations of environmental requirements/best practices, actions taken), and reports to environmental specialist, construction, and site management
  - (b) Community liaison person(s): number of days worked (hours community center open), number of people met, highlights of activities (issues raised, etc.), and reports to specialist, construction, and site management
  
- (ii) Health and Safety Supervision
  - (a) Health and Safety specialist: number of days worked, number of full and partial inspections, and reports to construction and project management
  - (b) Number of workers, work hours, metric of personal protection equipment (PPE) use (percentage of workers with full PPE, partial, etc.), worker violations observed (by type of violation, PPE or otherwise), warnings given, repeat warnings given, and follow-up actions taken (if any)
  - (c) Number of partial and full site inspections (by area: road section, work camp, accommodations, quarries, borrow areas, spoil areas, work site, clinic, HIV/AIDS center, community centers, etc.), highlights of activities (including violations of environmental, health and safety requirements observed, actions taken), and reports to health and safety specialist/construction/site management

**e. Worker Accommodations:**

- (i) Number of expats housed in accommodations and number of locals
- (ii) Date of last inspection and highlights of inspection including status of accommodations' compliance with national and local laws and good practice, including sanitation, space, etc.
- (iii) Actions taken to recommend or require improved conditions, or to improve conditions

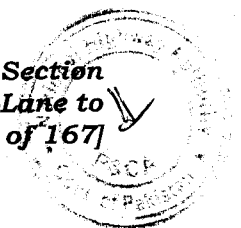
**f. Training:**

- (i) Number of new workers, number receiving induction training, and dates of induction training
- (ii) Number and dates of toolbox talks, number of workers receiving training related to Environment, Health and Safety (EHS)
- (iii) Number and dates of communicable diseases (including sexually transmitted diseases [STDs]) sensitization and/or training, number of workers receiving training (in the reporting period and in the past), and same questions for gender sensitization and flag person training
- (iv) Number and date of EHS-related prevention sensitization and/or training events, including number of workers receiving training on EHS Code of Conduct for Contractor's Personnel (in the reporting period and in the past), etc.

**g. Grievances:**

List of EHS-related grievances: grievances from affected communities and Worker grievances as recorded in the Contractor's grievance redress mechanism; traffic, road safety, and vehicles/equipment (health and safety or safeguard or environmental specialist needs to provide these requirements),

- (i) Traffic and road safety incidents and accidents involving project vehicles and equipment: provide date, location, damage, cause, follow-up



- (ii) Traffic and road safety incidents and accidents involving non-project vehicles or property (also reported under immediate metrics): provide date, location, damage, cause, and follow-up
- (iii) Overall condition of vehicles or equipment (subjective judgment by environmentalist); non-routine repairs and maintenance needed to improve safety and/or environmental performance (to control smoke, etc.).

***h.-Mitigations and Issues (what has been done):***

(i) Environmental Mitigations

- (a) Dust: number of working bowsters, number of watering per day, number of complaints, warnings given by environmentalist, actions taken to resolve; highlights of quarry dust control (covers, sprays, operational status); percentage of rock and spoil lorries with covers, and actions taken for uncovered vehicles
- (b) Erosion control: controls implemented by location, status of water crossings, environmentalist inspections and results, actions taken to resolve issues, and emergency repairs needed to control erosion or sedimentation
- (c) Quarries, borrow areas, spoil areas, asphalt plants, batch plants: identify major activities undertaken in the reporting period at each, and highlights of environmental protection—land clearing, boundary marking, topsoil salvage, traffic management, decommissioning planning, and decommissioning implementation
- (d) Blasting: number of blasts (and locations), status of implementation of blasting plan (including notices, evacuations, etc.), and incidents of off-site damage or complaints (cross-reference other sections as needed)
- (e) Spill clean-ups; if any: material spilled, location, amount, actions taken, and disposal (report all spills that result in water or soil contamination)
- (f) Waste management: types and quantities generated and managed, including amount taken off-site (and by whom) or reused, recycled, or disposed on-site
- (g) Details of tree plantings and other mitigations required undertaken in the reporting period
- (h) Details of water and swamp protection mitigations required undertaken in the reporting period
- (i) The Contractor shall identify and report on any special or temporary right of way and any additional facility that have temporary and/or permanent impacts on affected persons' assets, access to assets and/or livelihoods (income sources). It shall put in place corresponding mitigation measures, and implement them.

(ii) Health and Safety Mitigations

- (a) Details of hazard prevention and control mitigations required undertaken in the reporting period.



## Annex to the Particular Conditions

# Form of Performance Security

*(Note: See corresponding form in Section 9 of bidding documents)*



## Annex to the Particular Conditions

# Form of Advance Payment Bank Guarantee

*(Note: See corresponding form in Section 9 of bidding documents)*



## Annex to the Particular Conditions

# Form of Retention Money Guarantee

*(Note: See corresponding form in Section 9 of bidding documents)*



**Annex to the Particular Conditions**

**Resettlement Plan (RP)**

*Will be attached with the Bidding Documents (if applicable)*



# Section 9: Contract Forms

This section contains forms which, once completed, will form part of the Contract. The forms for Performance Security, Advance Payment Guarantee and Retention Money Security, when required, shall only be completed by the successful Bidder after contract award.

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# Notice of Intention for Award of Contract

[on letterhead paper of the Employer]

[date of notification]

To: [name of the Bidder]  
Attention: [insert name of the Bidder's authorized representative]  
Address: [insert address of the Bidder's authorized representative]  
Telephone/Fax numbers: [insert telephone/fax numbers of the Bidder's authorized representative]  
E-mail Address: [insert e-mail address of the Bidder's authorized representative]

This is to notify you of our intention to award the contract [insert name of the contract and identification number, as given in the Bid Data Sheet]. You have [insert number of days as specified in ITB 41.1 of the BDS] days from the date of this notification to (i) request for a debriefing in relation to the evaluation of your Bid; and/or (ii) submit a bidding-related complaint in relation to the intention for award of contract, in accordance with the procedures specified in ITB 46.1.

The summary of the evaluation are as follows:

## 1. List of Bidders

Name of Bidder	Bid Price as Read Out at Opening	Evaluated Bid Price

## 2. Reason/s Why Your Bid Was Unsuccessful

.....  
.....  
.....  
.....  
.....

## 3. The Successful Bidder

Name of Bidder:	
Address:	
Accepted Contract Amount:	
Duration of Contract:	
Scope of the Contract Awarded:	
Amount Performance Security Required:	

Authorized Signature: .....

Name and Title of Signatory: .....

Name of Agency: .....



# Letter of Acceptance

[on letterhead of Employer]

[date]

To: [Name and address of the contractor]

Subject: Contract No. [please specify]

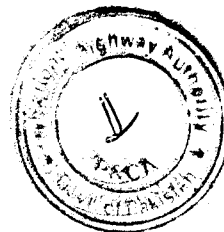
This is to notify you that your Bid dated [date] for execution of the [name of the contract and identification number, as given in the Bid Data Sheet] for the Accepted Contract Amount in the equivalent of [amount in words and figures and name of currency], as corrected and modified in accordance with the Instructions to Bidders is hereby accepted by our Agency.

You are requested to furnish the Performance Security within 28 days in accordance with the Conditions of Contract and any additional security required as a result of the evaluation of your bid, using for that purpose the Performance Security Form included in Section 9 (Contract Forms) of the Bidding Document.

Authorized Signature: .....

Name and Title of Signatory: .....

Name of Agency: .....



Attachment: Contract Agreement

# Contract Agreement

THIS CONTRACT AGREEMENT made the [date] day of [month], [year], 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 therein.

The Employer and the Contractor agree as follows:

1. In this Contract 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 Contract Agreement. This Contract Agreement shall prevail over all other Contract documents.
  - (a) the Contract Agreement
  - (b) Letter of Acceptance,
  - (c) Letter of Technical Bid,
  - (d) Letter of Price Bid,
  - (e) the Particular Conditions – Part A – Contract Data,
  - (f) the Particular Conditions – Part B – Special Provisions,
  - (g) the Particular Conditions – Part C – Corrupt and Fraudulent Practices,
  - (h) the Particular Conditions – Part D – Environmental, Health and Safety (EHS) Metrics for Progress Reports,
  - (i) List of Eligible Countries as defined by the Bank,
  - (j) General Conditions of Contract,
  - (k) the Specifications,
  - (l) the Drawings,
  - (m) completed Schedules including Bill of Quantities,
  - (n) Environment, Health and Safety Code of Conduct for Contractor's Personnel,
  - (o) Environment, Health and Safety Management Plan (EHSMP),
  - (p) The executed Joint Venture Agreement (If Contract is a Joint Venture), and
  - (q) any other documents shall be added here.<sup>15</sup>
3. In consideration of the payments to be made by the Employer to the Contractor as indicated in this Contract 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.

<sup>15</sup> Tables of Adjustment Data may be added if the contract provides for price adjustment (see GCC 13.7).

IN WITNESS whereof the parties hereto have caused this Contract Agreement to be executed in accordance with the laws of [name of the borrowing country] on the day, month and year indicated above.

Signed by .....  
for and on behalf of the Employer

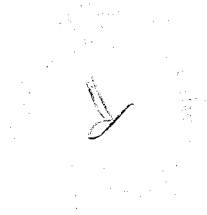
Signed by .....  
for and on behalf the Contractor

in the presence of

in the presence of

Witness, Name, Signature, Address, Date  
\_\_\_\_\_

Witness, Name, Signature, Address, Date  
\_\_\_\_\_



# Performance Security

[Bank's name, and address of issuing branch or office]<sup>16</sup>

Beneficiary: ..... [Name and address of the Employer] .....

Date: .....

Performance Guarantee No.: .....

We have been informed that [name of the contractor] (hereinafter called "the Contractor") has entered into Contract No. [reference number of the contract] dated [date] with you, for the execution of [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 [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 words]<sup>17</sup> [amount in figures] such sum being payable in the types and proportions of currencies in which the Contract Price is payable, 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 [date] day of [month], [year],<sup>18</sup> and any demand for payment under it must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.<sup>19</sup>

.....  
[Signature(s) and seal of bank (where appropriate)]

## NOTE TO THE BIDDER

If the bank issuing performance security is located outside the Employer's country, it shall be counter-guaranteed or encashable by a bank in the Employer's country.

<sup>16</sup> All italicized text is for guidance on how to prepare this demand guarantee and shall be deleted from the final document.

<sup>17</sup> The guarantor shall insert an amount representing the percentage of the accepted contract amount specified in the contract and denominated either in the currency(ies) of the contract or in any freely convertible currency acceptable to the Employer.

<sup>18</sup> Insert the date 28 days after the expected expiry of defect notification 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 [6 months] [1 year], 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."

<sup>19</sup> Or the employer may use "Uniform Rules for Demand Guarantees (URDG), ICC Publication No. 458, except that sub-paragraph (ii) of Sub-article 20(a) is hereby excluded" as appropriate.

# Advance Payment Guarantee

[Bank's name, and address of issuing branch or office]<sup>20</sup>

Beneficiary: ..... [Name and address of the Employer] .....

Date: .....

Advance Payment Guarantee No.: .....

We have been informed that [name of the contractor] (hereinafter called "the Contractor") has entered into Contract No. [reference number of the contract] dated [date] with you, for the execution of [name 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 words]<sup>21</sup> [amount in figures] 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 words]<sup>22</sup> [amount in figures] 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:

- (a) used the advance payment for purposes other than the costs of mobilization and cash flow support in respect of the Works; or
- (b) has failed to repay the advance payment when it has become due and payable in accordance with the conditions of the Contract, specifying the amount payable by the Contractor.

It is a condition for any claim and payment under this guarantee to be made that the advance payment referred to above must have been received by the Contractor on its account number [Contractor's account number] at [name and address of the bank].

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 ninety percent (90%) of the Contract Price has been certified payment, or on the [date] day of [month], [year],<sup>23</sup> whichever is earlier. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.<sup>24</sup>

<sup>20</sup> All italicized text is for guidance on how to prepare this demand guarantee and shall be deleted from the final document.

<sup>21</sup> The guarantor shall insert an amount representing the amount of the advance payment denominated either in the currency(ies) of the advance payment as specified in the Contract, or in any freely convertible currency acceptable to the Employer.

<sup>22</sup> Footnote 1.

<sup>23</sup> Insert the expected expiration date of the time for completion. 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 [6 months] [1 year], 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."

<sup>24</sup> Or the employer may use "Uniform Rules for Demand Guarantees (URDG), ICC Publication No. 458, except that sub-paragraph (ii) of Sub-article 20(a) is hereby excluded" as appropriate.

[Signature(s) and seal of bank (where appropriate)]

**NOTE TO THE BIDDER**

If the bank issuing advance payment guarantee is located outside the Employer's country, it shall be counter-guaranteed or encashable by a bank in the Employer's country.



# Retention Money Security

[Bank's name, and address of issuing branch or office]<sup>25</sup>

Beneficiary: ..... [Name and address of the Employer] .....

Date: .....

Retention Money Guarantee No.: .....

We have been informed that [name of the contractor] (hereinafter called "the Contractor") has entered into Contract No. [reference number of the contract] dated [date] with you, for the execution of [name of contract and brief description of works] (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, the Beneficiary retains moneys up to the limit set forth in the Contract ("the Retention Money"), and that when the Taking-Over Certificate has been issued under the Contract and the first half of the Retention Money has been certified for payment, payment of [insert the amount of the second half of the Retention Money or, if the amount guaranteed under the Performance Guarantee when the Taking-Over Certificate is issued is less than half of the Retention Money, the difference between half of the Retention Money and the amount guaranteed under the Performance Security] is to be made against a Retention Money guarantee.

At the request of the Contractor, we [name of the bank] as Guarantor hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of [name of the currency and amount in words]<sup>26</sup> [amount in figures] such sum being payable in the types and proportions of currencies in which the Contract Price is payable, 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.

It is a condition for any claim and payment under this Guarantee to be made that the second half of the Retention Money referred above must have been received by the Contractor on its account number [Contractor's account number] at [name and address of the bank].

This Guarantee shall expire, no later than the [date] day of [month], [year],<sup>27</sup> and any demand for payment under it must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.<sup>28</sup>

<sup>25</sup> All italicized text is for guidance on how to prepare this demand guarantee and shall be deleted from the final document.

<sup>26</sup> The Guarantor shall insert an amount representing the amount of the second half of the Retention Money or if the amount guaranteed under the Performance Guarantee when the Taking-Over Certificate is issued is less than half of the Retention Money, the difference between half of the Retention Money and the amount guaranteed under the Performance Security and denominated either in the currency(ies) of the second half of the Retention Money as specified in the Contract, or in a freely convertible currency acceptable to the Beneficiary.

<sup>27</sup> Insert the date 28 days after the expected latest of the expiry dates of Defect Notification Periods. 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 [6 months] [1 year], 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."

<sup>28</sup> Or the employer may use "Uniform Rules for Demand Guarantees (URDG), ICC Publication No. 458, except that sub-paragraph (ii) of Sub-article 20(a) is hereby excluded" as appropriate.

.....  
[Signature(s) and seal of bank (where appropriate)]

**NOTE TO THE BIDDER**

If the bank issuing retention money security is located outside the Employer's country, it shall be counter-guaranteed or encashable by a bank in the Employer's country.







**Construction of Additional Carriageway from Rajanpur - DG Khan N-55 Highway Section (121.5 Km) and DG Khan - DI Khan N-55 Highway Section (208.0 Km) from Two-Lane to Four-Lane - [Lot-1, Lot-2, Lot-3 and Lot-4]**

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