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Protecting Mujib through Nature-Based Solutions and Labour-Intensive Measures Supporting Syrian Refugees and Vulnerable Jordanians

(Mujib Tender Package)

Volume II :Technical Specifications

**Protecting Mujib through Nature-Based Solutions and Labour-Intensive Measures
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Technical Specifications**

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SPECIAL SPECIFICATIONS

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PART (1): GENERAL PROVISIONS

SECTION 1.02 ABBREVIATIONS AND DEFINITIONS

Sub-Section 1.02.1 ABBREVIATIONS

Add the following:

Additional list of abbreviations used in this project is shown in the drawings.

SECTION 1.03 SCOPE AND CONTROL OF WORKS

Sub-Section 1.03.1 INTENT OF CONTRACT

Add the following:

The Contractor shall arrange to carry out geotechnical site investigations, (Borings, test pits, testing...etc) conducted by a specialized firm, approved by the Engineer, under the direct supervision of the Engineer.

The results of such investigations shall be submitted to the Engineer in a form of factual and advisory report, upon which the safe and economical cut slopes along the road alignment shall be determined.

The cost of such borings, testing and analysis shall be paid to the Contractor from a provisional sum allocated in the Bill of Quantities.

Sub-Section 1.03.3 CONTRACTOR'S WORK AREAS

Add and amend as follows:

Noise, Pollution, and Nuisance: The Contractor shall ascertain and comply with any regulations concerning noise, pollution and other nuisance in addition to the obligations imposed by the Conditions of Contract and by **law**. The contractor must not disrupt the sensitivity of the area. It is the responsibility of the contractor to protect the wild life in the work area including, but not limited to trees, grass, running water, animals and wadi banks.

Nuisance: The Contractor shall take necessary precautions to prevent nuisance from smoke, dust, rubbish, water, polluted effluent and other causes.

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Roads and Footpaths: The Contractor shall protect public and private roads, footpaths and the like from damage by site traffic or other causes arising from the execution of the Works and shall repair any damage to the satisfaction of the relevant public authority or private owner.

Existing Features: The Contractor shall prevent damage to existing buildings, and archeological sites, fences, gates, walls, roads, paved areas and other features on the Site or adjacent thereto which are to remain in position during the execution of the Works.

Adjoining property: The Contractor shall:

(One) Take all reasonable precautions to prevent damage to adjoining property and, if any damage is caused as a result of the execution of the Works, make good to the satisfaction of the owner.

(Two) Preserve trees, planted fields, fences and the like in areas adjoining the Site and shall replace or re-plant as necessary the trees, crops etc. which are damaged or removed, and shall re-erect or replace fences, etc., in their original condition.

(Three) Advise owners of adjoining property of the dates on which work will be done, which may affect them and obtain their consent on temporary works on their land.

Water: The Contractor shall ensure that his operations do not cause damage to adjoining land by flooding; he shall provide temporary drains and ditches and shall pump away excess water if necessary.

Existing condition of roads, paths, fences and other features shall be recorded by photographs or surveys, if necessary, before work is carried out adjacent to them.

Sub-Section 1.03.4 WATER SUPPLY

Add the following:

"It is the Contractor's obligation to provide water with approved quality for the works, temporary works and for the Engineer's facilities. Where water main supplies are not available, the Contractor as agreed with the Engineer must provide suitable water supply and storage facilities.

Sub-Section 1.03.5 ELECTRICITY SUPPLY

Add the following:

3. The Contractor shall also provide at his expense electricity supply for the Engineer's facilities.

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Sub-Section 1.03.6 EXISTING UTILITIES AND OTHER OBSTRUCTIONS

Add and amend as follows:

1. At the commencement of the Contract, the Contractor shall examine the Site and identify/verify all utilities within the right-of-way limits, above or below ground including liaison with the concerned utility Authorities to obtain all information regarding the position and type of utilities and services, and shall record all such information on suitable Site Drawings which shall be submitted to the Engineer within one month of commencement of the Works. The Contractor shall, at his expense, excavate trial pits on site and/or take any other measures needed as may be necessary for identification and verification of existing utilities.
2. It is the responsibility of the Contractor to ensure the removal and/or relocation of the utilities obstructing the construction of the road works. The absence of such information shall not relieve the Contractor of this liability for the cost of any repair work necessitated by damage caused by him to such utilities in the course of his work and for cost of all losses arising from their disruption.
3. Any temporary or permanent relocation of utilities and services will only be permitted after agreement with the appropriate utilities authorities and the Engineer's Representative.
4. Concerning safeguards to existing pipes, cables, structures, ...etc., it shall be the Contractor's responsibility to safeguard by means of temporary supports, or otherwise, all pipes, cables, structures, or other things which would be liable to suffer damage if such precautionary measures were not taken.

Temporary safeguards shall be to the approval of the Engineer and the concerned Authority.

All temporary safeguards will be at the Contractor's expense.

Any additional costs, due to difficulty of working or to any other reason arising from the presence of the aforementioned, shall be borne by the Contractor.

5. The Contractor shall coordinate through the Employer and Engineer with the concerned utility authority, and the permanent relocation of utilities and services will only be considered and approved in locations where such elements interfere with the construction of permanent works.
 - a. In cases where the concerned utility authority requires that the relocation be executed by the authority, the Contractor will be required to pay to the authority the approved invoice cost. The Contractor will then be paid from the Provisional Sum in the B.O.Q the invoice cost plus additional percentage for follow up items, coordination, profit and overhead.
 - b. In cases where the Contractor is allowed by the utilities authority and directed by the Engineer's Representative to execute the

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approved relocations, he will be paid from the relevant pay items in the B.O.Q. The rate for the pay items shall include the cost for a completed, accepted and approved work including coordination, follow up, design, design approval and execution of work to the approval of the authority concerned.

6. Trees which interfere with the construction of permanent works shall be removed by the relevant authority. The Contractor will be required to define the interfered trees, coordinate through the Employer and Engineer with the relevant authority to follow up their removal. The Contractor will be required to pay to the authority the approved invoice cost. The Contractor will then be paid from the Provisional Sum in the B.O.Q. the invoice cost plus additional 10% for follow up, coordination profit, overhead and other works described above.
7. Any additional costs, due to difficulty of coordination, and follow up or to any other relevant reason shall be borne by the Contractor.
8. Where Pay Items are not provided in the Bills of Quantities, for any works prescribed in this section, these works shall not be measured for direct payment, but shall be considered as subsidiary works the cost of which shall be deemed to be included in the Contract prices for Pay Items.
9. The Pay Items for the work prescribed in this section are as shown in the Bill of Quantities.
10. It is the responsibility of the Contractor to ensure the removal and/or relocation of the utilities obstructing the construction of the road works within the contract period no additional time will be granted for the works prescribed in this section.

Sub-Section 1.03.9 SURVEYING EQUIPMENT

Add and amens Clause No. (1) as follows:

1. The Contractor shall provide onsite sufficient and suitable surveying instruments and other equipment for his own use and the Engineer's in setting out, leveling, and checking the works.

Sub-Section 1.03.13 USE OF EXPLOSIVES:

Add and Amend as follows:

No Explosives and detonators shall be used in the construction of this project.

Sub-Section 1.03.17 MEASUREMENT

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Add and amend as follows:

- 1) The work prescribed in this section shall not be measured for direct payment but shall be considered as a subsidiary work, the costs of which will be deemed to be included in the Contract prices for pay items, except items shown in Bill No. 1 "General Provisions", which shall be paid according to the units of measurement and rates.

**SECTION 1.05 CONTROL OF MATERIALS AND STANDARDS FOR
SAMPLING AND TESTING**

**Sub-Section 1.05.5 SOURCES OF SUPPLY AND QUALITY
REQUIREMENTS**

Add Clauses 4 and 5 as follows:

4. Where A.S.T.M., B.S.S, AASHTO and other technical standard specifications are specified for materials and equipment, the Contractor shall submit for the Engineer's approval a Certificate of Origin certifying that the material purchased is in conformity with the Specifications.
5. If a single source is specified for any material or a product, then the Contractor shall be bound by the same, and shall not change the said single source approval of the Engineer, and the Employer.

Sub-Section 1.05.7 SAMPLING AND TESTING PROCEDURES

Clause 4.1

Modify the last statement to read as follows:

"The minimum requirements for testing shall be as given in Part 9 of the Special Specifications".

Sub-Section 1.05.8 SAMPLING AND TESTING STANDARDS

Clause 2.2

Modify the last statement to read as follows:

"In the case of absence of an appropriate AASHTO Specification, the Latest ASTM, B.S and J.SS Specification shall be referred to subject to the approval of the Engineer".

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SECTION 1.07 FIELD CONTROL LABORATORY

Sub-Section 1.07.1 SCOPE

Add and Amend as follows:

1. Within One month from the Order to Proceed, the Contractor shall provide, deliver and maintain for the use of both the Contractor and the Engineer and for the duration of the Contract at an agreed location on the work site an approved mobile trailer or building with services, furniture, equipment, apparatus, fittings, materials and supplies as a field control laboratory. The Engineer and his staff will have the right to use the laboratory at any time, and as required, during the life of the project.

Sub-Section 1.07.2 MATERIALS

Add the following at the end of item 2.11:

- (iii) British Standard and other relevant standards, materials manuals and codes of practice referred to in this Contract.

SECTION 1.11 FIRST AID CENTERS, ACCIDENT PROCEDURES AND PREVENTION

Sub-Section 1.11.4 MEASUREMENT

Delete this sub-section and replace by:

Contractor shall provide one first aid facilities. No measurement or payment shall be made for this work which shall be considered subsidiary to all other pay items in the Bill of Quantities.

SECTION 1.13 MEASUREMENT PROCEDURES

Sub-Section 1.13.8 EARTHWORK VOLUME MEASUREMENTS

Delete Clause No. 6 and replace by:

6. The Contractor shall use personal computers in the computation of earthworks. The Contractor shall submit for the Engineer's approval details of the computer hardware, the earthwork software programs, the input and output, and a complete summary of the methods and procedures to be used. The continuance of such approval is contingent upon satisfactory results being achieved. If results are not as represented or are otherwise deemed unsatisfactory, the Contractor shall

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recompute the earthwork quantities by the cross-section method.

Add and amend as follows:

- Immediately following the order to proceed, the Contractor shall take cross-sections jointly with the Engineer and the Employer representative along the proposed road centerline to serve as the basis of earthwork volume measurements.
- The cross-sections shall cover an area sufficient to show the full extent of the proposed earthworks (cut and fill) and any other works to be executed under this Contract, and/or to establish the stability of the proposed earthwork slopes.
- Each section shall be identified by its chainage, and coordinates (X, Y, Z) in the National Grid system and description shall be given for all the survey points.
- Cross-section shall be plotted at an approved scale by the Engineer and delivered in AutoCAD files.
- Computer diskettes shall be delivered containing the above survey work along with the files containing the listing of the surveyed points (point number easting, northing, elevation and description) in an approved format suitable for input into AutoCAD and road design / surveying software.
- All the survey works shall be done by a Total Station, or, alternatively the angles shall be measured by a theodolite T2 (or similar) and the distance by an electronic instrument.

SECTION 1.14 SCOPE AND BASIS OF PAYMENT

Sub-Section 1.14.1 SCOPE OF PAYMENT

Add and amend as follows:

- 1- The contractor shall receive and accept compensation provided for in the contract as full payment for all labor, materials, tools, equipment, Designs, detailed survey and detailed working drawings for project works, organizational costs, insurance, shipping, duties and other charges, overheads, profit, royalties, transport, handling, setting up, payments to others for land or use of land or damage to property of others, all temporary works, incidental works necessary for proper completion of the works and which are not paid for separately but are subsidiary to the works of pay items, including drainage to protect the works during construction, haulage, tools, equipment, placement of materials where specified or directed, sheeting shoring, centering and supports, laboratory equipment and personnel for testing, housing and facilities and all other items necessary for or usual to proper execution, completion and maintenance of the works.

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PART (2): EARTHWORKS

SECTION 2.01 CLEARING & GRUBBING

Sub-Section 2.01.1 SCOPE

Add and amend as follows:

No clearing and grubbing operations shall commence before the surveys of the existing ground profiles have been carried out jointly with the Employer and the Engineer.

SECTION 2.02 REMOVAL OF OBSTRUCTIONS AND UTILITIES

Sub-Section 2.02.1 SCOPE

Add and amend as follows:

1. It is the Contractor's responsibility to liaison and cooperate with the Official Authorities for the removal of any properties obstructing the execution of the work which fall within the limits of construction. The obstructions shall include, but not limited to guardrail, curbstone, culverts, retaining walls, wingwalls, grouted riprap ditches and slopes, fences, Gates, water structures, walls, buildings, ... etc.
2. Existing utilities and obstructions shown on the drawings are given for guidance only, the Contractor should get familiar with all obstructions and utilities by site visits and coordination with private and public utility owners.
3. Any additional costs or delay to difficulty of working or to any other reason arising from the work described in this section, shall be borne by the contractor.

Sub-Section 2.02.3 MEASUREMENT

Add and amend as follows:

- Unless shown as Pay items in the Bills of Quantities the removal of all obstructions and utilities. (Except for utilities realignment described in 1.03.6) shall not be measured for direct payment, but shall be considered as subsidiary works the costs of which will be deemed to be included in the Contract prices for Pay Items.
- The Bills of Quantities contain a Provisional sum for "Compensation of utility owners of fences, gates, walls, buildings and land acquisition " this sum will be used by the employer to reimburse or compensate the above utility owners for the

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damage caused to their utilities.

- Expenses, overheads and profit associated with the above pay item shall be paid as percentage to the actual payment made as shown in the Bills of Quantities.
- Amend Pay items to read as shown in the Bills of Quantities under “Scope and Control of Works” in Bill No. (1).

SECTION 2.03 HIGHWAY EXCAVATION

Sub-Section 2.03.1 SCOPE

Add and amend as follows:

1. The work shall also include removal of existing asphalt layers where shown on the drawings or directed.

Sub-Section 2.03.2 CONSTRUCTION

Add and amend as follows:

Prior to any excavation work commencing, the Contractor shall conduct at his expense a comprehensive series of trial borings or trial pits along the highway reserve to obtain samples and carry out all testing necessary to determine the locations and quantities of material available for use in the selected unclassified excavation meeting the requirements of Article 2.06 for embankment construction.

The details of all borings or pits, the characteristics of all materials encountered and the results of all tests shall be submitted to the Engineer before any excavation work may commence. Based on this information the Contractor shall submit to the Engineer for approval his proposals for his methods and program for winning the required quantity of each material and handing it into the completed works.

The Contractor shall stockpile in locations all to the approval of the Engineer. He shall rework such stockpiled material into the works in accordance with his approved program submitted under clause 14 of the General Conditions of Contract. No separate measurement or payment will be made for this work, which is deemed to be included in the rates and prices for the item of work included in the Bill of Quantities.

The Contractor shall remove existing asphalt layers using proper equipment to ensure the removal of asphalt layers only to the satisfaction of the engineer. Excavated material shall be hauled away and either wasted, stockpiled, or deposited as directed and approved by the Engineer.

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Sub-Section 2.03.3 MEASUREMENT

Replace this Sub-Section by:

1. All excavated material (below top of subgrade) of whatever type shall be measured as “unclassified” which shall be deemed to include all materials encountered of any nature, including silts, clays, sand, gravel and granular materials, fractured, jointed and solid rock, unsuitable material, curbs and ditches.
2. Highway Excavation (including all unsuitable material, existing asphalt, existing curbstone, concrete speed bumps, concrete ditches, side ditches, furrow ditches, channels, wadi relocation, grading and trimming certain areas, steps for wadi stabilization, steps near stilling basins, and benching) shall be measured by cu.m. of material excavated, hauled away and either wasted, stockpiled, or deposited on or in vicinity of highway embankment areas, completed and accepted. Measurements shall be of volumes computed from the cross sections shown on the Drawings and the original ground elevations taken jointly by the Engineer, the Employer and the Contractor before clearing and grubbing operations. These excavations shall be referred to as Unclassified Highway Excavation.
3. Excavation of Unstable Material (from areas outside the ROW) where indicated or directed shall be measured as Unclassified Highway Excavation. Measurements shall be volumes computed from surveyed cross sections of original and final ground elevations.
4. Excavation required for the drainage of excavation areas, obliteration of disused roadways, and other ancillary excavation Works shall not be measured for direct payment, but shall be considered as subsidiary Works the costs of which will be deemed to be included in the Contract prices for Pay Items.
2. Cutting for benching in fill areas, if authorized and required as specified under sub-clause 3.3 of sub-section 2.06.3, shall be measured and included under the same pay item “Unclassified Highway Excavation”.

Pay Item

Unit of Measurement

(1) Unclassified Highway
Excavation

Cubic meter (cu.m)

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SECTION 2.06 EMBANKMENT CONSTRUCTION

Sub-Section 2.06.3 CONSTRUCTION

1. Foundation Preparation

Add and amend to Item No. (3.1) the following:

The top asphalt layer/s of the existing road shall be excavated, removed and treated as unsuitable material covered in **(SECTION 2.03 HIGHWAY EXCAVATION)**. The existing pavement layers underneath the existing top asphalt layers shall be plowed, scarified or otherwise broken up regardless of the height of the embankment to be placed thereon.

Sub-Section 2.06.5 MEASUREMENT

Add and amend to clause (2):

The volume of authorized benching shall be added to the embankment quantities computed as specified under this clause.

SECTION 2.07 SUBGRADE CONSTRUCTION AND TOPPING

Sub-Section 2.07.2 MATERIALS

Add the following, at the end of Clause No. (1) to read as follows:

And if tested after compaction a tolerance of 5% is allowed in upper limit for percentage of material passing sieve 200.

Add Clause No. (4)

4. Topping material shall not contain more than 5% organic material and shall be prepared for tests in accordance with AASHTO T-146.

Sub-Section 2.07.4 MEASUREMENT

Delete Clause No. (2), and replace by:

2. Subgrade layer or layers in approved insitu material shall be scarified to a minimum depth of 200 mm including removal of undesirable matter,

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compacted, completed and accepted. This work shall not be measured for direct payment but shall be considered as subsidiary Works the cost of which will be deemed to be included in the Contract Prices for Pay Items.

Delete the Pay Items and replace by: -

<u>Pay Item</u>	<u>Unit of Measurement</u>
(1) Topping material	Cubic meter (cu.m)

SECTION 2.09 EXCAVATION AND STRUCTURAL BACKFILL

Sub-Section 2.09.4 MEASUREMENT

- Add and amend to Clause No. (3) the following:
Energy dissipaters shall include check dams - concrete or stone -, loose and mortared stone riprap, stilling basin, settlement basin, drop inlet, ditch inlet and all types of catch pits.
- Modify Clause No. (4) to read as follows:

4. Structural Excavation shall be measured by cubic meter of material excavated for the major structures other than those specified in Clause 3 above, hauled away and disposed of as directed, or stockpiled on or in the vicinity of the Works, and the excavated areas backfilled, completed and accepted.
- Amend Clause No. (6) to read as follows:

6. Sub excavation of unsuitable material, hauled away and disposed of as directed, and backfilling with approved material of the excavated areas shall be measured and paid for as Unclassified Structural Excavation.
- Delete the Pay Items and replace by the following:

<u>Pay Item</u>	<u>Unit of Measurement</u>
(1) Unclassified Structural Excavation (For structural element)	Cubic Meter (cu.m)

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PART (5): CONCRETE, STEEL & STRUCTURES

SECTION 5.01 CONCRETE AND CONCRETE MIXES AND TESTING

Sub-Section 5.01.2 MATERIALS

Add the following to 5.01.2.1:

Unless otherwise noted in the specification or instructed by the Engineer, sulfate resistant Portland cement (SRC) shall be used for non-reinforced concrete (blinding concrete) and ordinary Portland cement shall be used for reinforced Concrete.

Sub-Section 5.01.4 CONCRETE STRENGTH REQUIREMENTS

Add the following:

Unless otherwise shown on the Drawings and Bill of Quantities:

- a. Concrete Class 15 shall be used in all plain concrete, such as mass concrete, blinding ... etc. It should have characteristic compressive strength of 15 N/mm² for cube or 11.55 N/mm² for cylinder based on 28 days compressive strength.
- b. Concrete Class 20 shall be used for cement grouted riprap. It should have characteristic compressive strength of 20 N/mm² for cube or 16 N/mm² for cylinder based on 28 days compressive strength.
- c. Concrete Class 30 shall be used in all Retaining Walls (Wing Walls) and all drainage structures. It should have a characteristic compressive strength of 30 N/mm² for cube or 24 N/mm² cylinder based on 28 days compressive strength.
- d. Concrete Class 40 shall be used in all reinforced concrete as specified on the drawings for the relevant reinforced structures. It should have a characteristic compressive strength of 40 N/mm² for cube or 32 N/mm² for cylinder based on 28 days compressive strength.

NB. - The minimum cement content should also satisfy the durability requirement as shown on table 5.5 A, table 5.5 B, table 5.5 C and table 5.6 of the General Specifications.

Sub-Section 5.01.8 MEASUREMENT

Add and amend to 5.01.8.2 the following:

Concrete shall be measured for different structural elements as shown in the Bill of Quantities.

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Measurement and Payment shall be based upon different classes of concrete as mentioned in Pay Items irrespective of type of form and/or falsework and irrespective of class of surface finish.

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Add the following to 5.01.8.4:

- 1) Where Pay Items for any items are not provided in the Bills of Quantities, the works prescribed in respect of such items or the items shown in the drawings shall not be measured for direct payment but shall be considered as subsidiary works the cost of which shall be deemed to be included in the Contract prices for Pay Items.
- 2) Backfill drains, structural backfill single size, shear key, induced contraction and expansion joints and any other items shown in the drawings shall not be measured for direct payment, but shall be considered as subsidiary to the concrete, the cost of which shall be deemed to be included in the Contract prices for pay items.
- 3) The expansion joint between existing and new culverts (Bridge) as shown in the drawings and the removal of the existing inlet or outlet concrete structures, if any, shall not be measured for direct payment, but shall be considered subsidiary to the concrete, the cost of which shall be deemed to be included in the Contract prices for pay items.
- 4) The removal of concrete sections and the utilization of the existing concrete elements – if any – which involves the exposure of reinforcement to provide the required reinforcement lap length shall not be measured for direct payment, but shall be considered subsidiary to the concrete, the cost of which shall be deemed to be included in the Contract prices for pay items.
- 5) Inspection holes with service pipes, deflection and contraction joints used for concrete parapets, all types of joints (except the joints stated in 5.18.5), shear bars, threaded inserts sleeves, expanded polystyrene fillings, joint filler, tar paper, sealants, epoxy (mortar, resin or adhesive paint) including any associated items shown in the drawings shall be considered subsidiary to the concrete, the cost of which shall be deemed to be included in the Contract prices for pay items.
- 6) The removal of existing parapets and wing walls of the existing bridge shall not be measured for direct payment, but shall be considered subsidiary to the concrete, the cost of which shall be deemed to be included in the Contract prices for pay items.

SECTION 5.03 STEEL REINFORCEMENT AND FIXING

Sub-Section 5.03.2 MATERIALS

Add and amend as follows:

- 1.1 Reinforcing steel bars shall be deformed bars of high tensile strength, Grade

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60, conforming to JSS/441/1986 or AASHTO M31M (ASTM A615M).

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SECTION 5.06 PLAIN AND REINFORCED CONCRETE STRUCTURES

Sub-Section 5.06.3 CONSTRUCTION

6. Finishing

Add the following to 6.1.1:

Concrete Deck Slab, bridge curb, parapets, wall copings, bottom face, vertical faces of cantilever deck slab, Deck Slab (bottom face), underpass portals, Edge Beams, Walls and Columns etc. which form architectural features shall have F1 finish.

Formed finishes of culvert surfaces shall be class F2.

All other finishes as described in the General Specifications.

SECTION 5.12 REINFORCED CONCRETE BOX CULVERTS

Sub-Section 5.12.3 CONSTRUCTION

Add the following new clause:

7. Where existing box culverts are to be extended:
 - 7.1 The Contractor shall break up the existing headwalls and wingwalls as required and with utmost care and in such a way so as not to damage the existing culverts. The Contractor shall break up the existing headwalls, deck and floor to expose the existing culverts for such a length as agreed with the Engineer to make the required connection. The contractor shall submit method of statement for a proper connection between existing and new culvert.
 - 7.2 Any undue damage caused by the Contractor while breaking such headwalls, wing walls or structure shall be repaired by the Contractor at his own expense.

SECTION 5.13 PIPE CULVERTS, STORM DRAINS, AND UTILITY DUCTS

Sub-Section 5.13.4 MEASUREMENT

- Delete Clauses 1 and 2 and replace by:
 1. Pipe Culverts, shall be measured by lin.m. of each pipe size and type furnished, installed or constructed, backfilled, completed, and accepted.

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2. Storm Drains and Utility Ducts shall be measured by lin.m. of each size and type furnished, installed or constructed, backfilled, completed, and accepted.
 3. Measurement of pipes for pipe culvert shall be made by multiplying the number of pipe rows in each culvert by the centerline slope length of pipe culvert installation. The length measured shall extend from end to end of pipe in the absence of headwall or end wall, or shall extend between inside (highway) faces of headwall and end wall.
- Add the following new clauses:
12. The quantities, measured as provided above, shall be paid for at the contract price per unit of measurement, for the pay items listed below which price and payment shall be full compensation for furnishing and placing all materials including all labor, tools, bents, equipment and incidentals necessary to complete the work described in this section.
 13. Pipes connected to Manholes or inlets from either end shall be measured as storm drain pipes. Other pipes shall be measured as pipe culverts.
- Delete the Culverts Pay Items and replace by:

	<u>Pay Item</u>	<u>Unit of Measurement</u>
(1)	Pipe Culvert (each diameter and type)	Linear Meter (Lin.m)
(2)	Storm Drain R.C. Pipe (each diameter and type)	Linear Meter (Lin.m)
(3)	Extension of Pipe Culvert (each diameter and type)	Linear Meter (Lin.m)
(4)	Storm Drain steel Pipe (each diameter and type)	Linear Meter (Lin.m)
(5)	Storm Drain UPVC Pipe (each diameter and type)	Linear Meter (Lin.m)

SECTION 5.14 DRAINAGE AND UTILITY STRUCTURES

Sub-Section 5.14.1 SCOPE

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- Add and amend to read as follows:
 1. This work shall consist of the construction of catch pits, catch basin, manholes, inlets and similar structures in connection with the drainage of groundwater from the surface and below the surface of land and paved surfaces.

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Sub-Section 5.14.4 MEASUREMENT

- Delete this sub-section and replace by:
 1. Manholes, inlets and catch pits shall be measured by the number of each type constructed, completed and accepted including furnishing and installation of all materials, frames, grates, covers and steps etc.
 2. Catch basins shall be measured by the lin.m. of each type constructed, completed and accepted including furnishing and installation of all materials, frames, grates, covers and steps etc.
 3. No separate measurement shall be made for any excavation, shorting, sheeting or backfilling, or for breaking into existing pipes or culverts in order to install new manholes, catch basins, and inlets, all such work being considered subsidiary to the construction of the manholes, catch basins, catch pits, and inlets, and for which no separate payments will be made.
 4. No separate measurement shall be made for metal gratings and frames, manhole covers and frames as shown on the Drawings which shall be considered subsidiary to the relevant pay items of catch basin and manholes.
 5. The amount of completed and accepted work, measured as provided for above, will be paid for at the unit prices bid per number for “Manholes”, and “Inlets” of various types as specified in the Bill of Quantities, which prices shall be full compensation for all excavation, shoring, sheeting, trimming, blinding and for furnishing and placing all materials, for all labor, backfilling, painting, equipment, forms tools and all other items necessary for the proper completion of the work.
 6. Relocation of inlets (all types) shall be measured by the number of such inlets dismantled, installed, completed and accepted including furnishing and installation of all materials, pipelines, frames, grates, covers and steps etc. No separate measurement shall be made for any excavation, shorting, sheeting or backfilling, or for breaking into existing pipes or culverts in order to install relocated inlets. all such work being considered subsidiary to the inlet relocation, and for which no separate payments will be made.

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- Replace pay items by the following:

	<u>Pay Item</u>	<u>Unit of Measurement</u>
(1)	Manhole (each type)	Number (No.)
(2)	Catch pits (each type and depth)	Number (No.)
(3)	Inlet (each type)	Number (No.)
(4)	Relocation of inlets (all types)	Number (No.)

SECTION 5.15 WATERPROOFING FOR STRUCTURES

Sub-Section 5.15.1 SCOPE

Add and amend as follows:

Approved bituminous paint (3 coats), shall be applied to all cast in place reinforced concrete surfaces below ground or in contact with backfilled material.

Sub-Section 5.15.6 MEASUREMENT

Add and amend as follows:

- 1) All works prescribed in this section shall not be measured for direct payment, but shall be considered as subsidiary work, the costs of which will be deemed to be included in the contract prices for pay items, except the pay items shown below, which shall be paid according to the units of measurement and rates.
- 2) Delete Pay items of this section and substitute by the following:

<u>Pay Item</u>	<u>Unit of Measurement</u>
(1) Bituminous paint (3 coats)	Square meter (Sq.m)

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PART (8): INCIDENTAL CONSTRUCTION

**SECTION 8.01 CONCRETE CURBS, GUTTERS, SIDEWALKS AND
PAVED MEDIANS**

Sub-Section 8.01.1 SCOPE

Add the following:

The work shall include the 10 cm concrete bed slab Class 25 used in the curb opening for roadway drainage as shown on the drawings.

Sub-Section 8.01.2 MATERIALS AND PRECAST MANUFACTURES

Add the following to Sub-Clause 4.7:

The precast concrete curbs shall be tested in accordance to the Jordan Standard Specification (JSS) No. 479/94.

8. Bedding

Add and amend as follows:

Bedding materials shall be as shown on the drawings. The materials shall conform to the relevant requirements of the specifications.

Sub-Section 8.01.4 MEASUREMENT

- Amend the following to Clause No. (1):

Edge beam shall be measured as In Situ concrete curb.
- Amend Clause No. (2) To read as follows:

“In situ concrete paving, precast concrete tiling and concrete bed slab used in the curb opening shall be measured ... etc.”
- Add and amend the following to Clause No. (4):
 - “Mortar, sand” is added to the first line.
 - Bedding materials shall be measured and paid as part of the pavement layers according to the type of bedding material shown on the drawings.
- Add Clause No. (5):

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Only the concrete of cast in place medians, sidewalks and curbs on bridges and approach slabs shall be measured by cu.m. and their reinforcement shall be measured by Ton all as part of the structure supporting it.

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- Add Clause No. (6):

Excavation and embankment construction and pavement layers, under sidewalks and median, shall be measured and paid as part of the highway pay items.

- Amend the pay items to read as follows:

<u>Pay Item</u>	<u>Unit of Measurement</u>
1. Precast Concrete Curb (Curb stone)-All types	Linear Meter (L.m)
2. In Situ Concrete for bed slab in the curb opening	Square Meter (Sq.m)
3. In Situ Concrete Paving	Square Meter (Sq.m)
4. Precast Concrete Tiling	Square Meter (Sq.m)
5. Edge beam	Linear Meter (L.m)

**SECTION 8.03 DITCH LININGS, ENERGY DISSIPATORS
AND SLOPE DRAINS**

The term “Mortared” shall mean “Grouted” where applicable.

Sub-Section 8.03.4 MEASUREMENT

Add and amend as follows:

- All Grouted Riprap or Loose Riprap required for protection works of whatever type including culvert terminals, chutes, ditch lining, dikes protection, embankment protection, and channel lining shall be measured and paid as specified in Section 8.05.
- Delete the Pay Items of this section.

SECTION 8.05 SLOPE PROTECTION AND STABILIZATION

The term “Mortared” shall mean “Grouted” where applicable.

Sub-Section 8.05.2 MATERIALS

1. Stone for Riprap

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Amend item No.1.1 to read as follows:

- 1.1 Stone for loose and grouted riprap shall consist of fieldstones furnished in broad flat shapes to the maximum extent practicable. All stone shall be hard, sound, durable, highly resistant to weathering, and shall be suitable as protection material for the intended purpose. The foundation surface of the slope shall be furnished with 7.5 cm layer of concrete Class (20). No direct payment shall be made for the material used in the foundation and the cost shall be included in the price of this item.

Amend item 1.4 to make the table of riprap classes read as follows:

Weight of Stones (Kg)				% of Total Weight Smaller than size shown
Class A	Class B	Class C	Class D	
50	200	1000	5000	95-100
20	100	500	2000	50-100
5	20	100	500	0-50
1	5	20	100	0-10

Sub-Section 8.05.3 CONSTRUCTION

3. Mortared Stone Riprap

Delete this clause and replace by:

3. Grouted Riprap

- 1.1 The surfaces (formation) upon which grouted riprap is to be placed shall be excavated, formed, and compacted to the required lines, grades, and sections as shown on the drawings or as directed. The surface shall be approved by the engineer before concrete placement.
- 1.2 Excavation and preparing for paved ditches shall be performed in a manner so as

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to anchor the structure into the sides of the ditches and protect the slopes to prevent seepage and scour. Unless otherwise specified, each anchor shall extend about 60 cm into the natural ground and shall be backfilled and tamped after completion. Surplus excavation shall be disposed.

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- 1.3 Stones shall be class B as specified in sub section- " 8.05.2 Materials", and shall be cleaned of all adhering dirt and clay before being placed. Stones shall first be laid into a layer of soft moist concrete composition of class "20". Unless otherwise indicated, the concrete layer thickness shall not be less than 75mm.
- 1.4 The successive layers of stone masonry shall be laid in concrete. Stone shall be placed by hand, laid with close, broken joints, and the stones so selected that they are firmly bedded against adjoining stones.
- 1.5 The larger stone shall be placed in the lower courses. Interstices between stones may be chinked with spalls or selected small stones firmly rammed into place, but voids between large and small stones or spalls shall be filled with concrete as the work progress. The concrete shall be vibrated, spaded, and rodded into place until the voids are completely filled. Excess material and spillage shall be cleaned from the front face of the riprap before hardening. The finished work shall present uniform tight surfaces.
- 1.6 The exposed concrete shall, immediately after completion of each section of riprap, be cured using clear compound in accordance with the relevant requirements of section 5.02 – " Concrete Handling, placing and Curing" .
Alternatively, if approved, the grouted riprap shall be protected from the sun and kept moist for at least 3 days after completion of concrete placement.

Sub-Section 8.05.4 MEASUREMENT

Amend Clause No. 8 read as follows:

8. Excavation, backfilling, slope surface preparation, mortar, concrete bedding Class (20) for grouted riprap, reinforcement and joints of concrete, and other ancillary items shall not be measured for direct payment, but shall be considered as subsidiary works the costs of which will be deemed to be included in the contract prices for pay items.

Amend the pay item (2) to read as follows:

Pay Item

Unit of Measurement

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2. Cement Grouted Riprap Cubic Meter (cu.m)

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SECTION 8.09 PAINTING OF STRUCTURES Sub-

Section 8.09.4 APPLICATION

3. Steelwork Painting Requirements

Add the following:

The reference No. of the paints to be used for the shop and field coats shall be:

- One shop coat of Paint Number (3).
- One field coat of Paint Number (6).
- One field coat of Paint Number (7).

SECTION 8.10 MAINTENANCE OF TRAFFIC AND DETOURS

Sub-Section 8.10.1 SCOPE Add

the following Clauses:

a) Traffic Control Facilities:

- a The Contractor shall provide means, devices, accessories, equipment, signs, materials and labor for traffic control through the construction area. The facilities above should ensure proper, safe and free movement of traffic along and around the highway under consideration to the satisfaction of the Engineer.

b) Solar Powered advance warning arrow boards:

- a The contractor shall provide solar powered advance warning arrow boards as specified here under, this facility should ensure proper, safe, and free movement of traffic a long and around the road under construction to the satisfaction of the engineer.
- b Specifications:

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10. General:

- Truly Solar Powered – Continuous, uninterrupted operation day and night
- Bright Visible Display – Legible under all conditions
- All Solid-State Control Module – Fully integrated with temperature compensated charge controller and low voltage disconnect
- Modular Construction – Easy maintenance and repair
- Torsion-type Axle – Smooth, stable ride
- Polyamide Epoxy Primer – Excellent rust and corrosion protection
- Acrylic Urethane Finish – Excellent appearance and durability

11. LAMP PANEL

- Panel Size.....240 cm x 120 cm (min)
- Panel Construction.....All aluminum with welded frame
- Panel Finish.....Matte black baked enamel finish
- Number of Lamps... ..25
- Lamp Intensity.....500 Candela
- Lamp Beam Angle.....28° horizontal x 12° vertical
- Lamp Construction.....LED (36 per lamp) in unbreakable sealed polycarbonate housing
- Lamp Shrouds.....360° high impact plastic
- Rear Panel indicators.....Three
- Lifting Mechanism.....1000lb. capacity automatic brake winch and cable

12. PHYSICAL

- Length Overall.....250cm
- Width Overall.....240cm
- Height Operating.....340cm
- Weight.....
- Hitch.....2½ inch pintle ring

13. CONTROLLER

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- Controller Circuitry.....Ultra-low power solid state
- Lamp Patterns.....All standard 25 lamp flashing and sequential
- Lamp Flash Rate.....30 per minute
- Lamp Dimming..... Manual and automatic
- Lamp Dimming Ratio.....50% fully dimmed at approximately Five footcandles
- Lamp Power Drivers.....Current limited and thermal overload protected with “soft start” feature
- Low Voltage Disconnect.....10.70 Volts
- High Voltage Disconnect.....15.10 Volts

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14. ENERGY SOURCE

- Operating Voltage.....12 Volts DC
- Battery Type.....6-Volt Heavy duty, deep cycle
- Battery Capacity.....520 Amp Hours
- Battery Status Indicator.....Displays full charge, normal and low battery condition
- Solar Array Construction.....Top-mounted solar panels in aluminum frame
- Solar Array Power Output.....50 watts
- Solar Charge Controller.....Fully automatic, temperature compensated

Sub-Section 8.10.2 MAINTENANCE AND PROTECTION OF TRAFFIC

Add and amend as follows:

- The Contractor shall conform to the “Manual On Traffic Control At Road work Zones” of the Ministry of Public Works and Housing.
- The Contractor shall ensure free accesses to existing carriages, factories, shops, buildings, facilities and like. The accesses shall be in a clear and safe condition free from obstructions.
- The Contractor shall execute the works as follows to insure free flow of traffic at all times:
 - Construct road widening and open for traffic.
 - Rehabilitation of existing road.
- In case detour is required at any location during construction of the project to facilitate movement of traffic around construction site, the Contractor shall submit for approval, details of the detour layout. It is the contractor’s responsibility to upgrade, rehabilitate and maintain parts of existing roads used as detours. The Contractor shall also furnish, erect and maintain signs necessary for safe and efficient direction and handling of traffic at specified locations as directed by the Engineer around the detour area.

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Sub-Section 8.10.3 DETOUR CONSTRUCTION

Delete clause (1), and add the following:

In case detour is required at any location in the project, the Contractor shall submit his proposal 20 days before its implementation for approval by the different concerned parties.

The public shall be informed in the daily newspapers and other information media (T.V. & Radio) of any instruction for using detour or closing roads.

Sub-Section 8.10.4 MEASUREMENT

Add and amend as follows:

Delete (2) and substitute by the following:

2. The solar powered advance warning arrow boards as prescribed in 8.10.1(4) shall be measured as shown in the bill of quantities.

The Contractor shall submit to the Employer, catalogues, brochures, specifications and prices, etc. relating to the various types of solar powered advance warning arrow boards required. Details shall be supplied from at least three manufacturers unless a particular make of the solar board is specified to be purchased.

SECTION 8.11 HIGHWAY SIGNING

Sub-Section 8.11.1 SCOPE

Add and amend as follows:

1. These works shall consist of:
 - Installation and Furnishing Highway signs, Post assemblies and overhead gantry structures, including construction of all necessary concrete and reinforced concrete foundations and including all sign panel lettering, as shown on the drawings.

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- Relocation of existing highway signs, post assemblies, construction of concrete and reinforced concrete foundations. The new signs locations shall be as per Engineer's instructions and as shown on the drawings.
- Removal of existing Signs, transport and handing over at the location specified by the Employer all as per Engineer's instructions and as shown on the drawings.

Sub-Section 8.11.2 MATERIALS

1. Concrete

Amend on follows:

- Concrete for sign supports footings shall be Class 25.

3. Sign Supports

Add and amend on follows:

- For rectangular shape signs with width equal or less than 2.5m, circular and rectangular signs, supports shall be 3-inch internal diameter weighing not less than 6.5 kg/l.m hot dip galvanized according to ASTM A123.
- For rectangular shape signs with width more than 2.5m, 4 inches internal diameter weighing not less than 7.5kg/l.m hot dip galvanized according to ASTM A123.
- All signs shall be of breakaway system.

7. Sign Materials:

Add and amend as follows:

- Steel sheet shall not be less than 1.5mm thick, hot-galvanized with a minimum of 250gm/m² on the two sides.

8. Reflective Sheeting

Add and amend as follows:

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Reflective sheeting shall be high intensity type for all signs including the temporary traffic signs.

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Sub-Section 8.11.4 MEASUREMENT

Delete sub-section 8.11.4 and substitute by the following:

1. New Small Signs (Triangular, Circular, Rectangular and Octagonal shape) shall be measured by number of signs installed in place and accepted (including sign posts).
2. Removal of existing signs shall be measured by the number of such signs transported and handed over at the location specified by the Employer all as per Engineer's instructions.
3. Payment shall be made according to the different classes of signs at the contract unit rate including, but not limited to, erection, excavation, backfilling, compaction, materials, painting, frames, posts, bolts, fitting accessories, breakaway system, concrete, reinforcement, foundation construction, sign support assemblies maintenance, removal and installation on new foundation shall not be measured for direct payment, but shall be considered as subsidiary Works, the costs of which will be deemed to be included in the Contract prices for the Pay Items.

Pay Item

Unit of Measurement

- | | |
|--|--------------|
| 1. New Small Signs (Triangular shape, circular shape Signs, Rectangular and Octagonal shape signs)
(area $\leq$ 1 Square meter) | Number (No.) |
| 2. Sign Removal
(all sizes and shapes) | Number (No.) |

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SECTION 8.12 PAVEMENT MARKINGS FOR TRAFFIC

Sub-Section 8.12.1 SCOPE

Add the following item:

- 1.3 Sprayed Thermoplastic, reflectorized paint (TRP) material shall be used for painted markings, lines and arrows in this Project.
- 1.4 Reflective pavement studs (3-cluster type) with 1 reflective surface – red, green, white or Amber shall be used in this project as shown in the drawings. Aluminum casting type shall be used with the reflective surface made of material which resist breaking and scratching. Reflective surface area shall not be less than (20.5 cm²).

Sub-Section 8.12.2 PAINT AND THERMOPLASTIC MATERIALS

12. Epoxy Adhesive for Pavement Markers

Add the following:

Bitumen can be used to install pavement markers, the bitumen shall have the following characteristics:

- Penetration shall not exceed 30mm
- Softening point shall range between 110-130°C
- Flash point shall not be less than 220°C
- Pouring Temperature shall be between 160-190°C

Sub-Section 8.12.3 APPLICATION AND INSTALLATION

5. Thermoplastic Reflectorized Paint (TRP) Application

Add and amend as follows:

The minimum thickness of sprayed lines (white and yellow) shall be 2mm.

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Sub-Section 8.12.5 MEASUREMENT

Add and amend as follows:

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1. Painted Pavement Lines and Painted Pavement Markings shall be measured net by linear meters and square meters or numbers as itemized in the Bill of Quantities of completed and accepted work including glass beads as per Specifications.
 2. Payment shall be made for the amount of completed and accepted work as measured by linear meters, square meters and number at the relevant Contract unit price, which shall be full compensation for furnishing all materials, for all labor, equipment, glass beads and tools, supplies and all other items necessary for the proper completion of the work.
- Pavement studs shall be measured by the number whether it has 1 or 2 reflective surfaces as shown on Drawings.

Delete pay items (1) to (9) and replace by the following:

<u>Pay Item</u>	<u>Unit of Measurement</u>
1. Painted Pavement Lines Marking (each class and width)	Linear Meter (L.m)
2. Painted Pavement Marking - for Pedestrian crossings, stop lines and Yield lines - (each class)	Square Meter (Sq.m)
3. Painted Pavement Markings for Hatching (each class)	Square Meter (Sq.m)
4. Direction Arrows	Number (No.)
5. Pavement studs (3-cluster type)	Number (No.)
6. Ceramic Non- reflective Pavement markers	Number (No.)

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SECTION 8.13 SPEED BUMPS AND RUMBLE STRIPS

Sub-Section 8.13.1 SCOPE

Add and amend as follows:

The works shall consist of furnishing materials and constructing speed bumps, concrete humps (speed tables), rumble strips, ceramic marker rumble strips, Raised Reflective Paint Rumble Strips and scored shoulder rumble strips, at the locations and as shown on the drawings.

Sub-Section 8.13.2 MATERIALS

Add the following:

1. Concrete hump (speed Table):

Materials used for concrete hump shall be as follows:

- a. Concrete grade 40 with fibre, the layer thickness will be 10 cm.
- b. Reinforced steel (Φ 10/20cm) grid.

2. Raised Reflective Paint

White thermoplastic road marking material used for rumble strips shall conform with the relevant requirements of Section 8.12- "Pavement Markings for Traffic".

The minimum thickness of lines shall be 6mm.

Sub-Section 8.13.3 CONSTRUCTION AND INSTALLATION

Add the following:

3. Concrete hump (speed Table):

- 3.1 Concrete hump shall be installed in the locations as shown on the drawings.
- 3.2 Asphalt shall be roughed and prepared for casting concrete.
- 3.3 Reinforced steel should be (Φ 10/20cm) grid.

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6. Raised Reflective Paint Rumble Strips

Raised Reflective Paint Rumble Strips rumble strips shall be installed in the appropriate geometric patterns as shown on the drawings and in accordance with the relevant requirements of Section 8.12- “Pavement Markings for Traffic”.

Sub-Section 8.13.4 MEASUREMENT

Add the following:

- 3- Concrete hump shall be measured by No. of humps furnished, installed, completed, (which include concrete reinforcement, hump asphalt, hump markings) and accepted as shown on the drawings.
- 4- Raised Reflective Paint Rumble Strips shall be measured by the Set of Strips furnished, installed, completed, and accepted as shown on the drawings.

Add the following pay item:

<u>Pay Item</u>	<u>Unit of Measurement</u>
5. Concrete hump (speed Table)	No.
6. Raised Reflective Paint Rumble Strips	Set

SECTION 8.16 STEEL GUARDRAIL AND CONCRETE SAFETY BARRIER

Sub-Section 8.16.1 SCOPE

Add and amend as follows:

The works shall also include:

- Removal of existing steel guardrail and concrete new jersey barriers, transport and handing over at the location specified by the Employer. The removal works shall be done according to acceptable engineering practice, cutting the exposed parts of the posts will not be allowed.

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- Relocation of existing steel guardrail and new jersey barriers with the required maintenance at the locations (as shown on drawings) and as specified by the engineer.
- Maintenance of existing steel guardrail
- The Contractor should ensure smooth profile for concrete barrier along the road alignment.

Sub-Section 8.16.2 MATERIALS

8. Concrete

Amend 8.2 as follows:

Concrete for Post Supports, Buried Footings and Anchors shall be Class 25.

Amend 8.3 as follows:

Concrete for New Jersey concrete barrier and terminal sections shall be Class 30.

10. Delineators

Amend 10.1 as follows:

Delineators for attachment directly to metal beam and box beam guardrail or to New Jersey Barrier shall be of the types shown on the drawings.

Sub-Section 8.16.5 MEASUREMENT

- Amend Clause No. 1 to read as follows:

Steel, Guardrail, New Jersey concrete barrier shall be measured by the linear meter furnished, installed and accepted Measurement shall be based on the dimensions as shown on Drawings or as directed, and shall include terminal sections and transition sections, which shall be measured in linear meter and paid for at the same rate for Guardrail and New Jersey concrete Barrier, as appropriate.

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- Delete Clause No. (2).
- Renumber Clauses 3 and 4 as (2) and (3).

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- Add the following clauses:
 - Maintenance of existing steel guardrail shall be measured as per items shown in Bill No.6. The price and payment shall be full compensation for furnishing and placing all materials including all labor, tools, equipment and incidentals necessary for a complete and accepted work as shown on drawings and as per engineer's instructions.
 - Concrete and reinforcement for the cast in place or precast concrete barrier located in highway median over structures shall be measured by linear meter furnished, installed completed and accepted. It shall be paid for at the same rate for New Jersey Concrete Barrier. The rate shall include, but not limited to, joints and tie reinforcement.
- **Pay Items shall be as shown in the Bill of Quantities.**

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PART (9): MINIMUM TESTS REQUIRED

Add the following Part to conform with the Standard Specifications requirements.
This Part contains the Minimum Tests Required for:

1. Earthworks
2. Concrete
3. Miscellaneous

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Technical Specifications**

Minimum Tests Required

Reference: General Specifications for Road and Bridges 1991 *

1. Earthworks

Date: Jan, 1992

Work Item	A Tests at source of material	Frequency for all tests mentioned under (A)	(B) Tests at Road site	Frequency for all tests mentioned under (B)
1-1 Embankment	1) Soil Classification (AASHTO) 2) Any other tests or required in technical specs and drawings 3) C.B.R	- Test for each borrow pit - Test for each cut area having suitable material - When materials quality change	1. Maximum Dry Density (mod proctor) 2. Soil Classification (AASHTO)	- Test for each 1000 lin.m and for each layer. - When materials quality change.
			3. Field Density 4. Any other tests as required by technical specs and drawings	- Test for each 1500 m2 or 100 Lin.m which ever be less, and for each layer.
1-2 Structural Backfill (at culverts)			1. Maximum Dry Density (mod proctor) 2. Granular Gradation 3. Plasticity Index	- Test for each structure - When materials quality change. - As requested
			4. Field Density 5. Any other tests as required by technical specs and drawings	- 50% of the layers or to the satisfaction of the Engineer.

* Typed from the original tables received from MPW & H.

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Minimum Tests Required

1. Earthworks (Cont'd)

Work Item	A Tests at source of material	Frequency for all tests mentioned under (A)	(B) Tests at Road site	Frequency for all tests mentioned under (B)
1-3 Structural Backfill at Bridge (piers)			1. Modified proctor 2. Granular gradation 3. Plasticity Index	- Test at each pier - When materials quality change. - As requested
			4. Field Density 5. Any other tests as required by technical specs and drawings	- 50% of the layers for each pier and to the satisfaction of the Engineer.
1-4 Structural Backfill at Bridges (abutments)			(same as above)	(Same as above)

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Minimum Tests Required

1. Earthworks (Cont'd)

Work Item	A Tests at source of material	Frequency for all tests mentioned under (A)	(B) Tests at Road site	Frequency for all tests mentioned under (B)
1-5 Subgrade and shoulders	1. Granular Gradation 2. Plasticity Index 3. C.B.R 4. Any other tests as required in technical specs and drawings	- Test for each borrow pit - Test for each cut area having suitable material - Test for each 4000 m3 - When materials quality change	1. Modified proctor 2. Granular Gradation 3. Plasticity Index. 4. Soil Classification (AASHTO) 5. C.B.R	- Test for each 1000 lin.m, and for each layer. - When materials quality change.
			6. Field Density 7. Any other tests as required by technical specs and drawings	- Test for each 1500 m2 or 100 Lin.m for each layer.
1-6 Selected subgrade	1. Granular Gradation 2. Plasticity Index 3. C.B.R 4. Any other tests as required in technical specs and drawings	- Test for each source - When materials quality change.	1. Modified proctor 2. Granular gradation 3. Plasticity Index 4. C.B.R	- Test for each 500 lin.m, and for each layer. - When materials quality change.
			5. Field Density 6. Layer thickness 7. Any other tests as required by technical specs and drawings	- Test for each 1500 m2 or 100 l.m for each layer.

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Minimum Tests Required

2. Concrete

Work Item	A Tests at source of material	Frequency for all tests mentioned under (A)	(B) Tests at Road site	Frequency for all tests mentioned under (B)
3-1 Fine aggregate for concrete	1. Gradation and fineness modulus. 2. Specific gravity and water absorption. 3. Sand equivalent 4. Organic and harmful materials 5. As requested in the special specs. and drawing 6. Sulphates & chlorides	- Test for each source - Test for each 2000 m3 - When materials quality change	1. Gradation and fineness modulus. 2. Specific gravity and water absorption. 3. Sand equivalent 4. Organic impurities & deleterious substances 5. Any other tests as requested in the special specs and drawing. 6. Sulphates & chlorides 7. Soundness test	- Test for each source - Test for each 300 m3 - When materials quality change.
3.2 Coarse aggregate for concrete	1. Gradation 2. Specific gravity and water absorption. 3. Abrasion 4. Harmful materials and organic impurities 5. Clay lumps and friable materials. Elongated and flaky particles Index. 6. Any other tests as required in technical specs and drawings	- Test for each source - Test for each 2000 m3 - When materials quality change	(Same tests mentioned under A) in addition to: 1. Abrasion test 2. Percentage of clay lumps and friable particles 3. Flakiness index & Elongation index.	- Test for each source - Test for each 300 m3 - When materials quality change.

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Minimum Tests Required

2. Concrete (Cont'd)

Work Item	A Tests at source of material	Frequency for all tests mentioned under (A)	(B) Tests at Road site	Frequency for all tests mentioned under (B)
3-3 Combined aggregates for concrete	1. Must satisfy fine and coarse aggregate requirements. 2. Gradation	- Test for each source - Test for each 4000 m3 - Test at change of material	- Must satisfy fine and coarse aggregate requirements - Gradation	- Test for each source - Test for each 500 m3 - Test at change of material
3-4 Water for concrete	1. PH. 2. Sulphates & chlorides 3. Water effect in concrete strength and properties. 4. Grease and oil.	- Test for each source - When source change	- Same tests mentioned under (A)	- Test for each source - When source changed
3-5 Concrete admixtures	1. Manufacturer certificate	- One for each type or manufacture	- Trial mixes to check suitability and percentages to be used based on site conditions, materials and manufacturer's recommendation. - Any other tests as requested in the special spec and drawing	- One for each type or manufacture.

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Minimum Tests Required

2. Concrete (Cont'd)

Work Item	A Tests at source of material	Frequency for all tests mentioned under (A)	(B) Tests at Road site	Frequency for all tests mentioned under (B)
3-6 Concrete (fresh) 3-6-1 Trial Mix Design			1. Slump test 2. Cubes or cylinders for crushing strength as specified 3. Workability	- Test for each class of concrete. - Test for change in any material
3-6-2 Ready Mix	1. The concrete and all its constituents shall satisfy all concrete and materials requirements as specified. 2. Workability 3. Any other tests as required in technical specs and drawings	- For each source - When any materials is changed	1. Slump test 2. Compression Tests (Take cubes) 3. Any other tests as required in technical specs and drawings	- For each transit mixer No. of Transit Mixers No. of sample 1 6 2-5 12 6-10 18 11-20 24 - For each 10 additional transit mixes take 6 additional samples (Test half the samples after week and the next half after 28 days).

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Minimum Tests Required

2. Concrete (Cont'd)

Work Item	A Tests at source of material	Frequency for all tests mentioned under (A)	(B) Tests at Road site	Frequency for all tests mentioned under (B)
3-6-3 Concrete Tests			1. Compression tests	- 6 specimens for every less or equal 80 m3. - 6 specimens for each casting day.
			2. Workability 3. Slump	- Test for each transit mixer at casting location.
3-7 Hardened Concrete			1. Core samples 2. Any other tests as required in the technical specs and drawing	- 3 cores for each part of a structure that did not satisfy the compression test after 28 days. - If samples are not taken during casting. - 3 cores for each part of a structure

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Minimum Tests Required

3. Miscellaneous

Work Item	A Tests at source of material	Frequency for all tests mentioned under (A)	(B) Tests at Road site	Frequency for all tests mentioned under (B)	
5-1 Concrete pipes (Plain / reinforced plant)	1. Abrasion 2. Proof & Ultimate loads 3. Materials used pipes shall satisfy each individual material requirement as specified 4. Any other tests as required in the technical specs and drawings	As per Specifications	1. Absorption 2. Proof & Ultimate loads 3. Any other tests as required in the technical specs and drawings	As per Specifications	
5- 2 Reinforced steel	1. Tensile strength 2. Yield point 3. Elongation 4. Bending 5. Dimensions 6. Any other tests as required in the technical specs and drawings	- For each source 3 specimens for each diameter (Specimens to be taken from different bars)	1. Tensile strength 2. Yield point 3. Elongation 4. Bending 5. Dimensions 6. Any other tests as required in the technical specs and drawings	Shipment load (Tons)	No. of Specimens
				< 10	1
				10 – 50	2
				51 – 100	3
				101 – 500	4
				501 – 1000	6
				Over 1000 tons divide shipment into the above mentioned ranges in accordance with Jordanian specifications.	

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Minimum Tests Required

4. Reinforced Earth Structure

Work Item	A Tests at source of material	Frequency for all tests mentioned under (A)	(B) Tests at Road site	Frequency for all tests mentioned under (B)
6-1 Reinforced Earth Structure.	1) Panels: 3 test panels material, formwork, tolerances, concrete compressive strength and concrete mixes. 2) Steel reinforcing strips and tie strips. - Physical and mechanical tests. - Fasteners. - Joint filler. 3) Backfilling: 3-1 Backfilling material: size and quality. 3-2 PH Value. 3-3 Sulfide content. 3-4 Backfilling material electrical resistance. 3-5 Organic matter content.	- As per specifications 07.8.7.2 (for each source). - As per specifications 8.07.03 (for each source). - As per specifications 8.07.6 (for each source). - As per specifications 8.07.6 (for each source). - As per specifications 8.07.6 (for each source). - As per specifications 8.07.6 (for each source). - As per specifications 8.07.6 (for each source).	3) Backfilling: 3-1 Compaction and layers thicknesses.	- As per specifications 8.07.4.