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SECTION 5.04 FORMS, FORM WORK AND FALSEWORK

SECTION 5.13 PIPE CULVERTS, STORM DRAINS, AND UTILITY DUCTS
STANDARD SPECIFICATIONS

The Standard Specifications forming part of this contract shall be the "Specifications for Highway and Bridge Construction", issued in 1991 by the Ministry of Public works and housing, Directorate of Planning Development, and shall hereinafter be referred to as Standard Specifications.

The Contractor shall provide at his own expense three original copies of the Standard Specifications: two for the Engineer’s use and one for his own use.
0. SPECIAL SPECIFICATIONS

0.1 General:

The Special Specifications shall be read in conjunction with the "Standard Specifications for Highway and Bridge Construction" of Ministry of Public Works and Housing of the Hashemite Kingdom of Jordan, 1991.

The MPWH “Standard Design for Reinforced Concrete Culverts No. 1-72” shall be implemented in the construction of culverts which are required but are not shown on the tender detailed drawings.

The Special Specifications shall amend, supplement, delete or modify the Standard Specifications and unless otherwise indicated, the provisions of these Special Specifications shall prevail over those of the Standard Specifications.

Section numbers in the Special Specifications refer to corresponding sections in the Standard Specifications and the sub-sections, clauses, and items contained in these sections constitute additions, modifications, and revisions to corresponding clauses in the Standard Specifications.

The Special and Standard Specifications shall be read together in conjunction with the Bills of Quantities, Drawings, and other Contract Documents, which shall be considered as mutually explanatory.

0.2 General Description of the Project:

0.2.1 General Description of the Project

The project is aimed to construct the internal roads network in Al Zaatari Camp (districts 2 and 12), which is located near Al-Mafraq City in Jordan. The concerned roads are approximately 12.0 km long. The work also includes to construct rainwater drainage system inside the camp.

0.2.2 The principal items of work to be carried out under this Contract include, but are not limited to, the following:

1- The construction of pavement layers including construction of road aggregate base courses, bituminous wearing courses, etc. all as shown on the Drawings.

2- All earthworks necessary to the completion of the work, including embankment, roadway excavation including removal and disposal of unsuitable material and dirt, ditches, sub-grade preparation, back-filling, filling and compaction, watering, rolling, sheathing, and sub-grade and slope finish.

3- The construction of new roads as shown on the drawings.

4- The Rehabilitation and/ or construction of all necessary drainage structures including pipe culverts, with inlet and outlet works, lined and unlined ditches, energy dissipaters, storm water drainage facilities, and all necessary protection works.

5- The work associated with existing utilities obstructing the construction of the road works as described in the tender documents.
0.3 Drawings:

0.3.1 The Contract Drawings consist of General Drawings which show general features, and such details as are necessary to give a comprehensive idea of the construction contemplated. Roadway alignment, profile grade, typical sections and pavement, locations and size of drainage structures, dimensions of all structural elements, reinforcement details, protection works, and other ancillary items are all shown on the Drawings.

0.3.2 The Contractor shall be responsible for preparing, thoroughly checking, and submitting to the Engineer, for his approval, sufficiently in advance, such working drawings as may be required or directed to show in detail all parts of the permanent works including detailed shop drawings, bar bending schedules, foundations of structures and other drawings if required.

The Contractor shall prepare working drawings and details for, but not limited to, the following:

1. All drainage provisions including culverts, ditches, spillways, gullies, channels, dikes, inlets, outlets, etc. according to site conditions.
2. Cut and fill slope geometry according to the natural ground cross-sections to be taken by the Contractor, materials used, ground conditions and the results of testing and geotechnical investigations performed by the Contractor where required.
3. Protection and stabilization measures for cut and fill slopes.
4. Relocation and diversion of existing utilities.

These working drawings shall be based on the Contract Drawings, field surveys, investigations and testing as may be required or directed, and shall be coordinated with the Contract Documents including compliance with the Standard and Special Specifications.

The Contractor shall also prepare such working drawings as may be necessary to shown in detail the temporary works and methods of construction he proposes to use including formwork.

No separate payment shall be made in respect of the preparation of the working drawings whose cost shall be considered subsidiary to the relevant pay items in the Bill of Quantities.

0.3.3 The Contractor shall be responsible for preparing and submitting to the Engineer a CD, one reproducible set of A1 size and two sets of A3 size of As-Built Drawings and cross-sections as may be required to show in detail all parts of the permanent works as-built. No separate payment shall be made in respect of the preparation of the As-Built drawings, whose cost shall be considered subsidiary to the relevant pay items in the Bill of Quantities.

0.4 Test Sampling:

The basis of taking samples and their repetitions for various construction items of the road project are shown in the following tables:
## Minimum Tests Required

Reference: The Specification for Road and Bridges, 1991

### 1. Earthworks

<table>
<thead>
<tr>
<th>Work Item</th>
<th>A Tests at Source of Material</th>
<th>Frequency for all tests mentioned under (A)</th>
<th>(B) Tests at Road site</th>
<th>Frequency for all tests mentioned under (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1 Embankment</td>
<td>1- Soil Classification (AASHTO)</td>
<td>- Test for each borrow pit</td>
<td>1- Maximum Dry Density (Mod. Proctor)</td>
<td>- Test for each 500 L.m. and for each layer.</td>
</tr>
<tr>
<td></td>
<td>2- Any other tests as required in the Specifications and Drawings</td>
<td>- Test for each cut area having suitable material</td>
<td>2- Soil Classification (AASHTO)</td>
<td>- When materials quality change.</td>
</tr>
<tr>
<td></td>
<td>3- C.B.R</td>
<td>- When materials quality change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2 Structural Backfill</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(at culverts)</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>
### Minimum Tests Required

**1. Earthworks (Cont'd)**

<table>
<thead>
<tr>
<th>Work Item</th>
<th>A Tests at Source of Material</th>
<th>Frequency for all tests mentioned under (A)</th>
<th>(B) Tests at Road site</th>
<th>Frequency for all tests mentioned under (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3 Structural Backfill at Bridges (piers)</td>
<td></td>
<td>1- Modified proctor 2- Granular gradation 3- Plasticity Index</td>
<td>- Test at each pier. - When materials quality changes. - As required</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4- Field Density 5- Any other tests as required by specs and drawings</td>
<td>- 50% of the layers for each pier and to the satisfaction of the Engineer.</td>
<td></td>
</tr>
<tr>
<td>1-4 Structural Backfill at Bridges (abutments)</td>
<td></td>
<td>(Same as above)</td>
<td>(Same as above)</td>
<td></td>
</tr>
</tbody>
</table>
Minimum Tests Required
1. Earthworks (Cont'd)

<table>
<thead>
<tr>
<th>Work Item</th>
<th>Tests at Source of Material</th>
<th>Frequency for all tests mentioned under (A)</th>
<th>Tests at Road site</th>
<th>Frequency for all tests mentioned under (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5 Subgrade and shoulders</td>
<td>1- Granular Gradation</td>
<td>- Test for each borrow pit</td>
<td>1- Modified proctor</td>
<td>- Test for each 1000 L.m and for each layer.</td>
</tr>
<tr>
<td></td>
<td>2- Plasticity Index</td>
<td>- Test for each cut area</td>
<td>2-Granular gradation</td>
<td>- When materials quality Changes</td>
</tr>
<tr>
<td></td>
<td>3- C.B.R.</td>
<td>- Test for each borrow pit</td>
<td>3-Plasticity Index</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4- Any other tests or</td>
<td>- When materials quality Change</td>
<td>4-Soil Classification</td>
<td></td>
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<tr>
<td></td>
<td>required in specs and</td>
<td></td>
<td>(AASHTO)</td>
<td></td>
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<tr>
<td></td>
<td>drawings.</td>
<td></td>
<td>5-C.B.R</td>
<td></td>
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<td></td>
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<td></td>
<td>6- Field Design</td>
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<td>7- Any other tests as</td>
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<td></td>
<td>required by technical</td>
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<td></td>
<td>specs and drawings</td>
<td></td>
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<td></td>
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<td></td>
<td>5-Field Density</td>
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<td></td>
<td></td>
<td>6-Layer thickness</td>
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<td></td>
<td></td>
<td></td>
<td>7-Any other tests as</td>
<td></td>
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<td></td>
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<td>required by technical</td>
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<td>specs and drawings</td>
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<td>5-Field Density</td>
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<td>6-Layer thickness</td>
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<td>7-Any other tests as</td>
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<td>required by technical</td>
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<td>specs and drawings</td>
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<td></td>
<td></td>
<td>5-Field Density</td>
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<td></td>
<td></td>
<td>6-Layer thickness</td>
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<td></td>
<td></td>
<td></td>
<td>7-Any other tests as</td>
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<td></td>
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<td></td>
<td>required by technical</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>specs and drawings</td>
<td></td>
</tr>
</tbody>
</table>

1-6 Selected subgrade

<table>
<thead>
<tr>
<th>Work Item</th>
<th>Tests at Source of Material</th>
<th>Frequency for all tests mentioned under (A)</th>
<th>Tests at Road site</th>
<th>Frequency for all tests mentioned under (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-6 Selected subgrade</td>
<td>1- Granular Gradation</td>
<td>- Test for each source</td>
<td>1- Modified proctor</td>
<td>- Test for each 500 L.m and for each layer.</td>
</tr>
<tr>
<td></td>
<td>2- Plasticity Index</td>
<td>- When materials quality Change</td>
<td>2-Granular gradation</td>
<td>- When materials quality Changes</td>
</tr>
<tr>
<td></td>
<td>3- C.B.R.</td>
<td></td>
<td>3-Plasticity Index</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4- Any other tests or</td>
<td></td>
<td>4-C.B.R</td>
<td></td>
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<td></td>
<td>required in specs and</td>
<td></td>
<td>5-Field Density</td>
<td></td>
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<td></td>
<td>drawings.</td>
<td></td>
<td>6-Layer thickness</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>7-Any other tests as</td>
<td></td>
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<td></td>
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<td></td>
<td>required by technical</td>
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<td>specs and drawings</td>
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<td>5-Field Density</td>
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<td>6-Layer thickness</td>
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<td></td>
<td></td>
<td></td>
<td>7-Any other tests as</td>
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<td></td>
<td>required by technical</td>
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<td>specs and drawings</td>
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<td>5-Field Density</td>
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<td>6-Layer thickness</td>
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<td></td>
<td>7-Any other tests as</td>
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<td></td>
<td></td>
<td>required by technical</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>specs and drawings</td>
<td></td>
</tr>
</tbody>
</table>

4 soils with C.B.R.
### Minimum Tests Required

#### 2. Base & Subbase

<table>
<thead>
<tr>
<th>Work Item</th>
<th>A Tests at Source of Material</th>
<th>Frequency for all tests mentioned under (A)</th>
<th>(B) Tests at Road site</th>
<th>Frequency for all tests mentioned under (B)</th>
</tr>
</thead>
</table>
| 2-1 Base & Subbase | 1- Granular Gradation  
2- Plasticity Index  
3- Abrasion  
4- C.B.R.  
5- Sand equivalent  
6- Fractured faces (for bases)  
7- Any other tests or required in technical specs and drawings | - Test for each source  
- Test for each 2000 m3  
- When materials quality Change | 1- Modified proctor  
2- Granular gradation  
3- Plasticity Index  
4- C.B.R.  
5- Abrasion  
6- Sand equivalent | - Test for each 500 L.m and for each layer.  
- When materials quality Change |
|                 |                                                                    |                                             | 7- Field Density  
8- Layer thickness  
9- Any other tests as required by technical specs and drawings  
10- Clay lumps & friable particles | - Test for each 750 m2 and for each layer |
### Minimum Tests Required

#### 3. Concrete

<table>
<thead>
<tr>
<th>Work Item</th>
<th>A Tests at Source of Material</th>
<th>Frequency for all tests mentioned under (A)</th>
<th>(B) Tests at Road site</th>
<th>Frequency for all tests mentioned under (B)</th>
</tr>
</thead>
</table>
| 3-1 Fine aggregate for concrete | 1- Gradation and fineness modulus  
2- Specific gravity and water absorption.  
3- Sand equivalent  
4- Organic and harmful material.  
5- As requested in the special specs. And drawings  
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 and harmful material.  
5- Any other tests and requested in the specs. And drawings  
6- Sulphates & chlorides  
7- Soundness test | - Test for each source  
- Test for each 300 m3  
- When materials quality Changes |
| 3-2 Coarse aggregate for concrete | 1- Gradation  
2- Specific gravity and water absorption.  
3- Abrasion  
4- Organic and harmful materials  
5- Clay lumps and friable materials. Elongated and flaky particles Index  
6- Any other tests as required in 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 Changes |
### Minimum Tests Required

#### 3. Concrete (Cont'd)

<table>
<thead>
<tr>
<th>Work Item</th>
<th>A Tests at Source of Material</th>
<th>Frequency for all tests mentioned under (A)</th>
<th>(B) Tests at Road site</th>
<th>Frequency for all tests mentioned under (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-3 Combined aggregates for concrete</td>
<td>1- Must satisfy fine and coarse aggregate requirements. 2- Gradation.</td>
<td>- Test for each source - Test for each 4000 m³ - Test at change of material</td>
<td>- Must satisfy fine and coarse aggregate requirements - Gradation</td>
<td>- Test for each source - Test for each 500 m³ - Test at change of material.</td>
</tr>
<tr>
<td>3-4 Water for concrete</td>
<td>1- PH. 2- Sulphates &amp; chlorides 3- Water effect in concrete strength and properties 4- Grease and oil.</td>
<td>- Test for each source - When source changes</td>
<td>Same tests mentioned under (A)</td>
<td>- Test for each source - When source change.</td>
</tr>
<tr>
<td>3-5 Concrete admixtures</td>
<td>1- Manufacturer's Certificate</td>
<td>- One for each type or manufacturer</td>
<td>- Trail mixes to check suitability and percentages to be used based on site conditions, materials, and manufacturer's recommendations. - Any other tests as requested in the spec and drawing.</td>
<td>- One for each type or manufacturer.</td>
</tr>
</tbody>
</table>
### Minimum Tests Required

#### 3. Concrete (Cont'd)

<table>
<thead>
<tr>
<th>Work Item</th>
<th>A Tests at Source of Material</th>
<th>Frequency for all tests mentioned under (A)</th>
<th>(B) Tests at Road site</th>
<th>Frequency for all tests mentioned under (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-6 Concrete (fresh)</td>
<td></td>
<td></td>
<td>1- Slump test</td>
<td></td>
</tr>
<tr>
<td>3-6-1 Trail Mix Design</td>
<td></td>
<td></td>
<td>2- Cubes or cylinders for crushing strength as specified.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3- Workability</td>
<td></td>
</tr>
<tr>
<td>3-6-2 Ready Mix</td>
<td>1- The concrete and all its constituents shall satisfy all concrete and materials00 requirements as specified.</td>
<td>- For each source - When any material changes</td>
<td>1- Slump test</td>
<td>- For each transit mixer.</td>
</tr>
<tr>
<td></td>
<td>2- Workability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3- Any other tests as required in technical specs and drawings</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. of Transit Mixers</th>
<th>No. of samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>2-5</td>
<td>12</td>
</tr>
<tr>
<td>6-10</td>
<td>18</td>
</tr>
<tr>
<td>11-20</td>
<td>24</td>
</tr>
</tbody>
</table>

- For each transit mixer, Compression Tests (Take cubes) for each 10 additional transit mixes take 6 additional samples (Test half the samples after week and the next half after 28 days).
## Minimum Tests Required

### 3. Concrete (Cont’d)

<table>
<thead>
<tr>
<th>Work Item</th>
<th>A Tests at Source of Material</th>
<th>Frequency for all tests mentioned under (A)</th>
<th>(B) Tests at Road site</th>
<th>Frequency for all tests mentioned under (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3-6-3 Concrete Tests</strong></td>
<td></td>
<td>1- Compression tests</td>
<td></td>
<td>6 specimens for every less or equal 80 m³.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2- Workability</td>
<td></td>
<td>6 specimens for each casting day.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3- Slump</td>
<td></td>
<td>Test for each transit mixer at casting location</td>
</tr>
<tr>
<td><strong>3-7 Hardened Concrete</strong></td>
<td></td>
<td>1- Core samples</td>
<td></td>
<td>3 cores for each part of a structure that did not satisfy the compression test after 28 days.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2- any other tests as required in the technical specs and drawing</td>
<td></td>
<td>3 cores for each part of a structure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>If samples are not taken during casting.</td>
</tr>
</tbody>
</table>
### Minimum Tests Required

#### 4. Asphalt Mixes

<table>
<thead>
<tr>
<th>Work Item</th>
<th>A Tests at Source of Material</th>
<th>Frequency for all tests mentioned under (A)</th>
<th>(B) Tests at Road site</th>
<th>Frequency for all tests mentioned under (B)</th>
</tr>
</thead>
</table>
| 4-1 Materials in Asphalt mix. (At Batching Plant) | 1- Specific gravity and water absorption.  
2- Abrasion test  
3- Chert content  
4- Clay lumps and friable particles.  
5- Flaky and elongated particles  
6- Soundness | – Test for each source  
– When material quality changes  
– As required | | |
| 4-2 Materials used in Asphalt mix (from hot pins) | 1- Gradation  
2- Specific gravity and water absorption.  
3- Plasticity index  
4- Sand Equivalent  
5- Stripping with asphalt | – Test for each source  
– When materials quality change  
– As required. | | |
### Minimum Tests Required

#### 4. Asphalt Mixes

<table>
<thead>
<tr>
<th>Work Item</th>
<th>A - Tests at Source of Material</th>
<th>Frequency for all tests mentioned under (A)</th>
<th>(B) - Tests at Road site</th>
<th>Frequency for all tests mentioned under (B)</th>
</tr>
</thead>
</table>
| 4-3 Asphalt mix design each layer (At Batching Plant) | 1- Complete mix design in accordance with the American Asphalt Institute (MS2) 2- Loss of stability | – For each project  
– When materials quality changes.  
– When results are not consistent with the mix design results.  
– As required. | | |
| 4-4 Asphalt mix for each layer | **At Batching Plant**  
1- Stability  
2- Flow  
3- Extraction (binder content and gradation)  
4- Air voids  
5- Voids in mineral aggregates.  
6- Daily Marshall Density | – Test each 3 working days  
– Test for each batching plant  
– As requested. | **Behind spreader**  
1- Stability  
2- Flow  
3- Extraction (binder content and gradation)  
4- Air voids  
5- Voids in mineral aggregates.  
6- Daily Marshall Density  
7- Loss of Stability | – Test each working days  
– Test for each batching  
– As requested, |
| | 7- Loss of Stability | – As requested,  
– Once per week | | |
| | | 8- Road density and thickness (after final compaction) | | – Test each 200 L.m. per lane and for each layer.  
– As requested. |
## Minimum Tests Required

### 5. Miscellaneous

<table>
<thead>
<tr>
<th>Work Item</th>
<th>A Tests at Source of Material</th>
<th>Frequency for all tests mentioned under (A)</th>
<th>(B) Tests at Road site</th>
<th>Frequency for all tests mentioned under (B)</th>
</tr>
</thead>
</table>
| 5-1 Concrete pipes (Plain/reinforced plant) | 1- Abrasion  
2- Proof & Ultimate loads  
3- Materials used in pipes shall satisfy each individual material requirements as specified  
4- Any other tests as required in the specs and drawings. | - Specimen for each pipe diameter | 1- Absorption  
2- Proof & Ultimate loads  
3- Any other tests as required in the specs and drawings. | Pipes No. of Diameter specimens  
In (mm)  
100 – 500 2-3  
501 – 1000 3-6  
1001 – 1500 6-9 |
| 5-2 Reinforcing steel | 1- Tensile strength  
2- Yield point  
3- Elongation  
4- Bending  
5- Dimensions  
6- Any other tests as required in the 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 specs and drawings | Shipment No. of Load (Tons) 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 the Jordanian specifications. |
PART 1 GENERAL PROVISIONS

The following sections, subsections, clauses, items of the Special Specifications shall amend, supplement, modify or delete the pertinent sections, subsections, clauses, and items etc., of the Standard Specifications.

SECTION 1.03 SCOPE AND CONTROL OF WORKS

SUB-SECTION 1.03.4 WATER SUPPLY

Add the following clause at the end of sub-section:

The Contractor shall provide at his expense water for the works, temporary works. Where mains supply is not available, the Contractor shall provide suitable water supply and storage facilities as agreed with the Engineer.

SUB-SECTION 1.03.6 EXISTING UTILITIES AND OTHER OBSTRUCTIONS

Clause No. 2 Existing Utilities

1- Categories of Obstructions

1.1 Obstructions shall be classified as follows:
   1.1.1 Existing private and public owned utilities, above and below ground, which are required to be protected, adjusted, relocated, or removed.
   1.1.2 Obstructions, above and below ground (other than utilities), which are required to be taken down, demolished, or excavated, and removed, as appropriate.

- Delete Items No. 2.1 & No.2.3 and replace by:

  2.1 Utilities shall include, but not be limited to, existing water lines, sewer lines, wire lines, service connections, water and valve boxes, light poles and masts, pylons, cableways, arid all utility appurtenances within the limits of the proposed construction.

  2.3 At the tendering phase, the Contractor shall examine the Site and identify/verify all requested roads and all utilities within the implementation location. Further, at the commencement of the Contract, shall examine the Site and identify / verify all utilities within the right-of-way above or below ground and shall record all such information on suitable Site Drawings which shall be submitted to the Engineer. The Contractor shall for this purpose excavate trial pits on site or take any other measures needed as may be necessary for identification and verification of existing utilities.

The Employer/Engineer takes no responsibility as to the correctness, accuracy; completeness or validity of information obtained from the Drawings obtained from Employer/Engineer, and the Contractor shall be fully responsible for his own interpretation and shall execute whatever additional investigations are necessary to obtain the needed information at the Contractor’s

The costs of all related Works concerning verification and identification of existing utilities including detection means, mapping and detailing of drawings, and co-ordination with respective Authorities, shall be fully borne by the Contractor.
The necessary utility diversions may be specified or directed to be carried out by the Contractor. Alternatively, the Employer may make arrangements for such works to be executed by other parties.

The Contractor shall:

- Take into account that the diversion works shall be carried out to the requirements and approval of the Utility Owners and/or under their supervision, and also where required by the Utility Owners, specialist diversion works shall be carried out by accredited specialist Contractors. The utility owners have the right to direct the relocation process themselves through nominating their own subcontractor who works under the Contractor.

- Verify and identify the existing utilities. Coordinate with the relevant Authorities and map these utilities and prepare detailed and accurate existing utilities drawings identifying the utilities that are in service and those that are dead or abandoned. Submit these existing utilities Drawings, which are accurate and detailed giving location of utilities in plan and section with all pertinent data of the respective utility, to the Engineer and to the Utility Owners.

- Work out and develop, in coordination with the Utility Owners and the Engineer, the approved utilities diversion schemes that will be required to enable the execution of the Works and also maintain continued utilities services in the Area, and to the users.

- Provide superintendence for the execution of the utility diversions whether they are carried out by the Contractor directly or by other parties employed by the Contractor.

- Provide accurate As-Built Drawings of all permanent utility diversions that are executed under the Contract.
SUB-SECTION 1.03.9 SURVEYING EQUIPMENT

- Add the following to Item No. (1):

The Contractor shall provide the Engineer, to his satisfaction, with a complete set of survey equipment necessary for checking the Works as follows:

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Electronic total station for angles, distances, and coordinates measurements:</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>- Angle Accuracy (1-2)°.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Distance Accuracy Higher than (2) mm + 2ppm.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Equipped with two keyboard and display in both faces.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- PCMCIA memory card compartment in one face build-in.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Integrated with surveying programs.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Facilities to load and erase programs.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Plug-in battery (rechargeable).</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>- External battery (rechargeable) + battery cable.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>- Recharger for both batteries.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>- PCMCIA memory card MIN IMB.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>- Heavy – duty wooden tripod.</td>
<td>2</td>
</tr>
<tr>
<td>1.1</td>
<td>- Single Prism Holder</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>- Reflector Pole.</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>- Prism.</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Automatic Level.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Standard Deviation not more than 2mm/1km double runs levelling.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Telescope Magnification not less than 30x.</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Wooden Tripod.</td>
<td>2</td>
</tr>
<tr>
<td>2.2</td>
<td>Levelling Staff / CM. Graduation 4m</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>30 m Steel Tape with extra length before zero point.</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Steel Pocket Tape with 2.5 m long.</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Surveying umbrella</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>Ranging Roads 2.5 m long</td>
<td>20</td>
</tr>
<tr>
<td>7</td>
<td>Field Books</td>
<td>40</td>
</tr>
<tr>
<td>8</td>
<td>Level Books.</td>
<td>40</td>
</tr>
</tbody>
</table>

- Add the following to Clause No. 3:

All surveying equipment shall be periodically maintained and calibrated by the Contractor, as directed by the Engineer.

All survey equipment shall meet the specifications above and the Engineer’s satisfaction.

On completion of the Contract, the survey equipment shall become the property of the Contractor.
SUB-SECTION 1.03.17 MEASUREMENT

- add new clause 4:

4. All other 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.

- Delete pay items, and replace by:

<table>
<thead>
<tr>
<th>PAY ITEM</th>
<th>UNIT OF MEASUREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.03.6(1)</td>
<td>Realignment &amp; Replacement all types of Utilities</td>
</tr>
<tr>
<td>1.03.6(2)</td>
<td>Overhead &amp; Profit, Percentage of the pay item above</td>
</tr>
</tbody>
</table>

SECTION 1.07 FIELD CONTROL LABORATORIES

1.07. 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.

1.07.3 Delivery and Completion

- Delete Clause 1 from the specifications and replace by the following:

“The Contractor shall deliver the laboratory ready and complete for use of the Engineer and to his satisfaction within 21 days from the date of commencements and before any work requiring material control and laboratory testing is started. If the laboratory is not ready and complete, then the Contractor, at his expense, shall carry out all tests required by the Engineer at a material testing office approved by the Engineer.”

SECTION 1.11 FIRST AID CENTERS, ACCIDENT PROCEDURES AND PREVENTION

1.11.4 Measurement

Delete this Sub-Section and replace by:

The 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.

SECTION 1.14 SCOPE AND BASIS OF PAYMENT

Renumber Section 1.14 as 1.16 and add the new section 1.14 and 1.15 as follows:
SECTION 1.14 TOPOGRAPHIC SURVEY

1.14.1 Scope

Immediately following the Notice to Commence, the Contractor shall carry out a topographic survey (by cross-sections) of the project road along the proposed centerline, check all the reference points benchmarks and jointly with Employer and/or Engineer’s Representative take cross sections, to serve as the basis of earthwork volume measurements and envisaged revision of road profile.

The topographic survey shall be done in presence of the Engineer and the Employer.

The survey shall also cover side and service roads, as shown on the Drawings or directed.

1.14.2 General Requirements

1. The topographical survey shall be carried out by taking cross-sections along the proposed road centerline at a maximum interval of 20m. The cross-sections shall cover an area of at least 75 m each side of the mainline centerline. However, where required or directed, the Contractor shall increase the width of the area covered by the survey sufficiently 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 cross-section shall include the related topographic details, for the existing and proposed sections, but not limited to the following:

- Street furniture (electricity poles, lighting columns, traffic signals, road signs, gullies, manhole covers, etc.).
- Boundary features (fences, gates, walls, hedges, etc.).
- Survey data (National Grid survey points and PRMs).
- Slopes and earthworks (cuttings and embankments, quarries, refuse tips, cliffs, etc.).
- Water and drainage features (watercourses, wadis, wells, reservoirs, ditches, channels, etc.).

- All natural and manmade features.
- Buildings (outline threshold elevation).
- Structures (culverts, retaining walls, sign, and signal gantries, etc.).
- Roads, tracks, footpaths (kerb line or edge of surfacing to carriageways, steps, traffic islands, parking, or amenity areas).
- Industrial features (tanks, electricity overhead lines and substations, etc.).

2. 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 surveyed points.

3. The road shall be plotted in plan at an approved scale and the elevations of all the surveyed points shall be shown.

4. Cross-sections shall be plotted at an approved scale and delivered in Autocad (Version 2000 or later) files.

5. All the survey works shall be done by a Total Station.
1.14.3 Measurement and Payment

No separate payment shall be made in respect of the required topographic survey and production of maps and cross-section in hard reproducible copy or computer files. The cost of this work shall be considered subsidiary to the pay items related to earthworks.

SECTION 1.15 GENERAL AND MANAGEMENT OBLIGATIONS

1.15.1 Statutory and Other Obligations

1. 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.

2. Noise: Compressors, percussion tools and vehicles are to have effective silencers of a type recommended by the manufacturers of the equipment. Pneumatic drills and other noisy appliances shall not be used during days of rest or after normal working hours without the consent of the Engineer’s Representative.

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

1.15.2 Protection of Property

1- 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.

2- Existing Features: The Contractor shall prevent damage to existing buildings, 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.

3- Adjoining property: The Contractor shall:

(a) 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.

(b) 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.

(c) Advice owners of adjoining property of the dates on which work will be done which may affect them and obtain their consent for erection of scaffold or other temporary works on their land.

4- 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.

5- 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.
1.15.3 Contractor’s Technical Staff

1- The Contractor shall provide the minimum number of technical staff consist of engineers, inspectors and surveyors for the entire construction period as follows:

- A Project Manager (Contractor’s Representative): A Civil Engineer with at least 10 years of experience on similar road and infrastructure projects.

- A Highway / Site Engineer: A Civil Engineer with minimum 5 years of experience on similar road projects and infrastructure projects.

- A Planning Engineer: a civil engineer with at least 5 years of experience in construction planning, programming, and scheduling.

- Two Surveyor: each has Diploma with at least 7 years of experience on road and infrastructure projects or survey civil engineer with at least 5 years of experience on road and infrastructure projects.

- Two Highway / Site Inspectors: each has Diploma with at least 7 years of experience on road and infrastructure projects or a civil engineer with minimum 5 years of experience road and infrastructure projects.

- A Quantity Surveyor: Diploma with at least 7 years of experience on road and infrastructure projects or a Quantity Surveyor civil engineer with minimum 5 years of similar road projects.

- One Lab technician: has Diploma with at least 7 years of experience on road and infrastructure project or a civil engineer with minimum 5 years of experience road and infrastructure projects.

- Environmental, Health & Safety Manager: A Civil Engineer with a minimum of 5 years of experience in monitoring EHS worksites management measures.

1.15.4 Site Administration

1. Engineer’s Site Meetings: The Engineer’s Representative will hold site meeting as frequently as deemed necessary for the efficient management of the Works and he will distribute minutes.

2. The Contractor shall attend all such meetings and secure the attendance of subcontractors and others if requested by the Engineer’s Representative.

3. The Contractor shall provide all drawings, dimensions and other information required for the proper execution of subcontract works and of associated builder’s work and shall accept responsibility for the accuracy and fitness of subcontract works.

1.15.5 Records and Reports

1. Labour Record: provide each week a record showing the number and description of workmen employed each day on the works including those employed by subcontractors.
2. Materials and plant record: Provide each week a record showing the quantity and description of all materials and plant delivered to the site complete with copies of delivery notes.

3. Equipment Record: provide each day a record showing the number, type and capacity of all Contractor’s equipment, excluding hand tools daily employed on the Works.

4. Daily work record: provide each day a record showing activities performed and locations in which work has been carried out and any other matter requested by the Engineer’s Representative.

5. Monthly Report: provide monthly report, which summarize the daily and weekly reports and deliver to the Engineer’s Representative not later than one week following the end of each month.

6. Climatic Conditions: Measure and keep an accurate daily record of and submit to the Engineer’s Representative at the end of each week:

   - Air temperature : maximum and minimum
   - Humidity : maximum and minimum
   - Rainfall : total in mm and hours

7. Special Records: in the event of delays for which an extension of time for compilation is sought under Clause 20 or in the event of any claim for costs, the Contractor keep such special records of the circumstances as the Engineer’s Representative may require and submit copies regularly for his inspection.

1.15.6 Program

1. The Contractor shall provide a computer-based programme in critical path network form using "Primavera " latest edition software or a software of similar capabilities, showing at least the following information:

   (a) Contract milestones (Engineer’s order to commence, Commencement date, date for completion of sections of the Works, date for completion of the whole of the Works etc.).

   (b) Durations and earliest / latest start and completion dates for each construction activity.

   (c) Free and total float time for each activity.

   (d) Number of working days per week.

   (e) Number of working shifts per day for each construction activity.

   (f) Construction activities are to be scheduled so as not to exceed twenty-five (25) working days without the approval of the Engineer.

   (g) Dates and times for procurement of materials and plants.

   (h) Dates and times for performance of work by Subcontractors.

   (i) Dates for supply by the Engineer of drawings and other information.
(j) Dates for submission by the Contractor of shop drawings, samples and the like and dates for approval by the Engineer.

(k) Dates and times for work to be performed by other contractors.

(l) Dates and times for testing and commissioning plant and installations.

(m) Bar chart showing earliest dates and total float of activities.

Monitoring: The Contractor shall monitor progress of the Works and shall revise the program, as required by Conditions of Contract. Copies of revised programs etc. and notices of actual and forecast delays and shortfalls shall be regularly given to the Engineer.

Computer Programme: The Contractor shall provide the Engineer with a copy of the computer disk for the original and revised programs, schedules, and estimates.

The Contractor shall provide original licensed copy of software for the use of the Engineer with a valid maintenance agreement for the duration of the project. Cost of which are deemed to be borne by the Contractor.

1.15.7 Drawing to be Provided By The Contractor

General: The Engineer will supplement the Contract Drawings with further drawings issued in accordance with the Conditions of Contract as he deems necessary. The Contractor shall prepare all other drawings required for Temporary Works and for fabrication and coordination of trades and prepare all shop drawings and other drawings and documents required under the contract.

Shop Drawings: The Contractor shall prepare and submit for approval, all Contractor Shop Drawings together with calculations, technical specifications, product information and other supporting data, etc., as required by the Specifications or instructed by the Engineer, in good time to meet the programme requirements, including an allowance of 30 days for Engineer’s approval and extra time for resubmission in the case of rejection and, in any case, a minimum of 45 days before the work is to be commenced or order placed, as applicable. Drawings shall be carefully checked before submission to ensure that no conflict exists with other parts of the Works.

Unless otherwise approved or instructed by the Engineer the Contractor shall submit for Engineer’s approval Shop Drawings for all the permanent works specified under the Contract. These shall incorporate the setting out and survey data carried out by the Contractor as well as any modification necessitated by site conditions. The Contractor shall reflect such modification on the Shop Drawings or any other drawings that are deemed necessary to fulfill such task.

The Shop Drawings shall be submitted in such details in order to encompass all the elements of such permanent works and/or as specified in the Contract documents and/or as instructed by the Engineer. The Contractor shall include the scheduled submittals in the Program of Works and shall describe in detail such intended submissions in the Method Statement at the Commencement of the Works. Approval of the Method Statement and Program of Works shall not relieve the Contractor from its obligation under the Contract.

The Contractor is not relieved from submitting additional shop drawings as deemed necessary for the execution of the Works, or as instructed by the Engineer or as required for the execution of variations.
The Contractor shall not execute any of the permanent works without the prior approval by the Engineer of the relevant Shop Drawings for such works.

Supporting data, such as manufacturers' standard details etc., shall be in English or accompanied by a translation, and are to be properly referenced to the Drawings and Specifications.

Produce for submission and approval:

1. The Contractor shall submit three copies of drawings and other documents for approval to the Engineer.

2. Within 30 days of receipt at the Engineer’s office, the Engineer will return one copy of the drawings stamped as:
   a. approved, or
   b. approved subject to amendments shown on the returned copy or in an accompanying letter, or
   c. rejected, with recommendations for resubmission.

3. In the case of approval, work may be commenced, or orders placed.

4. In the case of approval with qualifications, work may be commenced, or orders placed, at the Contractor’s risk; providing the qualifications are implemented. The Contractor shall submit revised drawings for approval.

5. In the case of rejection, the Contractor shall resubmit until approval is obtained.

6. The Contractor shall provide four copies, and reproducible copy if required, of all approved material.

1.15.8 Measurement and Payment

No separate payment will be made for the General and Management Obligations described in this section. The cost shall be considered as subsidiary to other items in the Bill of Quantities.
PART 2 EARTHWORKS

SECTION 2.02 REMOVAL OF OBSTRUCTIONS AND UTILITIES

2.02.3 MEASUREMENT

Replace this Sub-Section by:

1. Removal and disposal of large rocks and boulders which exceed the requirement of Sub-Section 2.01.2 Clause 2 (Page2-1) shall be measured by cu.m of "Unclassified Highway Excavation" as prescribed in Section 2.03 - "Highway Excavation".

2. Removal of roadways and existing bituminous and cement concrete pavement including cutting by saws shall be measured by cu.m of "Unclassified Highway Excavation" as prescribed in Section 2.03 - "Highway Excavation".

3. Clearing & Grubbing of the existing PIPE CULVERTs shall be measured by Liner meter including removing all existing debris, dust, dirt, sand, vegetation, stones and rocks and all other protruding debris and transporting all produced materials outside the site to approved locations.

4. Removal and disposal of walls, foundations, tin roof buildings, existing buildings, guard house, structures other than trees, plastic green houses, abandoned pipes and culverts, ducts, wells, ditches, sidewalks, curbs, light poles, traffic light, abandoned telephone and electrical poles, traffic and advertising signs, advertising billboards, poles and signs foundation, road furniture and any other obstructions 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.

5. Permanent Realignment or Replacement of Utilities shall be measured and paid in accordance with the rates set in the Bill of Quantities of respective works. Where the Bills of Quantities contain a PROVISIONAL SUM for "Realignment or Replacement of Utilities", this SUM will be used by the Employer for approved realignment, replacement or permanent diversion Works carried out by the Contractor as directed by the Engineer and agreed with the Employer. This SUM shall only be expended against works which are not accounted for as Pay Items elsewhere in the Specification or the Bill of Quantities.

6. Temporary Relocation and Diversion of Utilities required during construction, supporting, and protecting realigned Utilities, and existing Utilities that are to remain in place, including all necessary Temporary Works in this respect, 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.

7. Survey works investigation and mapping of existing utilities and obstructions, coordination costs, and fees requested by Utility Owners 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.
SECTION 2.03  HIGHWAY EXCAVATION

2.03.1  Scope

- Replace Clause No (1) by:

  1. These works shall consist of excavating material in the cut sections of the highway, including channels, grading for watercourses, ditches and wadi relocations (but excluding borrow pits and structural excavation) all as and where shown on the Drawings, and hauling the excavated material either to locations for highway embankments or to stockpiles or to waste.

2.03.2  Construction

- Replace Item No (1.1) by:

  1.1  All suitable soils, rock, boulders, existing pavement layers, and other materials complying with Tables 2.1 and 2.2 shall be excavated in such a manner that they can be utilized, if intended to be used, as embankment fill or in subgrade, shoulder or elsewhere as appropriate.

- Replace Item No. (1) of Table 2.1 by:

  2.1  1- Maximum dry density not less than 1.9 (T-180)

- Replace Item No. (4) of Table 2.1 by:

  2.1  4- Maximum size not more than 1/3 of the loose layer thickness.

- Replace Items No. (3) and No. (4) of Table 2.2 by:

  2.2  3- Bulk specific gravity not less than 2.25 t/m3 (ASTM-C127).
  2.2  4- Water absorption not more than 6% (ASTM-C127).

- Replace Item No. (1.3) by:

  1.3  Materials such as existing concrete, bituminous, granular, or other surfaces or other materials shall, if shown on the Drawings or directed, be stockpiled for a specific purpose or for future use. Such materials shall be excavated and handled in a manner that will exclude foreign or undesirable material. Stockpiles shall be neatly formed and maintained in an approved manner.

- Replace Item No (6.6) by:

  6.6  The subgrade in cut, where the soil is unsuitable for retention as the subgrade layer, shall be excavated to a depth of 250mm below top of subgrade to allow for subsequent placing and compaction of the subgrade layer (topping). If the material of the subgrade is suitable for retention as subgrade layer, then scarify to the required depth, water and compact.
2.03.3 Measurement

- Replace this Sub-Section by:

1. All excavated material (to the top of subgrade) of whatever type (except for unauthorized undercut below top of subgrade) 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, and existing pavements.

2. **Highway Excavation (including roadside ditches and unsuitable materials)** 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 Consultant and the Contractor before clearing and grubbing operations.

3. Ditch Excavation shall not be measured for direct payment but shall be considered as a part of unclassified excavation.

4. Excavation Quantities that needed to remove of unsuitable soil **below top of subgrade** shall be considered as subsidiary Works the costs of which will be deemed to be included in item 2.04 “Subgrade layer” as illustrated on Bill of Quantities.

5. Excavation of Unstable Material (from areas outside the ROW) where indicated or directed shall be measured as Unclassified Highway Excavation. Measurements shall be of volumes computed from surveyed cross sections of original and final ground elevations. When cross sectioning is impractical in the opinion of the Engineer, approval may be given to measure volumes in the vehicles removing such excavated material, adjusted to reflect in situ volumes.

6. Excavation for benching slopes in fill/embankment sections shall be measured in cubic meters and shall be considered as unclassified Highway Excavation.

Delete The Pay Items and replace by:

<table>
<thead>
<tr>
<th>Pay Items</th>
<th>Unit of Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.03 Unclassified Highway Excavation</td>
<td>Cubic Meter</td>
</tr>
</tbody>
</table>
SECTION 2.06  EMBANKMENT CONSTRUCTION

2.06.3 Construction

- In Clause 1 General, Replace sub-clause 1.5 by:

  1.5  Rock fill can be used in the top 20 cm of the embankment (below the topping). Water must be added as required, and with approval of the Engineer, to achieve maximum compaction.

- Add Sub Clause 1.15 to Clause 1 General, as follows:

  1.15  The elevations of embankments layers can be checked out using a Total Station of 1-2 second standard deviation, instead of using the Level.

- In Clause 3 Foundation Preparation, Replace sub-clause 3.2 by:

  3.2  Clearing and grubbing, and removal of trees stumps, shall be undertaken. The top 150 mm of the surface on which the embankment, of less than 1.5 m height is to be placed shall be scarified, brought to uniform moisture content within the specified range, and compacted to Engineer satisfaction, no compaction test is required.

- In Clause 3 Foundation Preparation, Replace sub-clause 3.5 by:

  3.5  All surfaces to receive rock fill are to be cleared and all vegetation removed off site before filling is placed. All unsuitable soil shall be removed to a depth as required by the Engineer. Soil surfaces are to be scarified and compacted to Engineer Satisfaction; no compaction test is required. Compaction is to be to a depth of at least 200 mm below ground surface. Hard or smooth surfaces are to be roughened before filling is placed existing road surfaces and the like are to be broken up and removed.

2.06.5 Measurement

- Delete only the word "less" in Clause 2 line 4 and substitute by the word "excluding"

- Add clause 8 as follows:

  8.  Embankment for benching as required in section 2.06 item 3.3 shall be paid for as Embankment Construction. The compacted fill for Diversion Dykes will also be paid for as Embankment Construction.

Delete The Pay Items and replace by:

<table>
<thead>
<tr>
<th>Pay Items</th>
<th>Unit of Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.06</td>
<td>Embankment Construction</td>
</tr>
</tbody>
</table>
SECTION 2.07 SUBGRADE CONSTRUCTION AND TOPPING

2.07.2 Materials

- Amend Clause No. (1) to read:

1. Topping shall consist of selected borrow material having a 4-day soaked CBR of not less than 25% when tested in accordance with AASHTO T193, when compacted at 100% modified proctor (AASHTO T-180) and having P.I. not exceeding 12% when tested according to AASHTO T89 and T99 and when the sample is prepared according to AASHTO T146. Topping gradation shall be reasonably smooth without gap grading. All topping material shall pass 75mm sieve and not more than 18% + 2% shall pass 0.075mm No. (200) sieve. A tolerance of 2% is allowed in upper limit for percentage of material passing No. 200 sieve if tested after compaction.

2.07.3 Construction

Add point (3.4 and 3.5) to Clause 3 as follows:

3.4 The elevations of Topping layer can be checked out using a Total Station of 1-2 second standard deviation, instead of using the Level.

3.5 Where the subgrade is located on existing road surfaces, unsuitable materials should be removed and replaced, whereas suitable surfaces should be scarified and compacted, all as directed by the Engineer.

2.07.4 Measurement

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

2. Subgrade layer or layers in approved in situ material shall be scarified to a minimum depth of 200 mm including removal of undesirable matter compacted, completed, and accepted. This work 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 item 2.04 “Subgrade Layer (Topping)” as illustrated in Bill of Quantities.

Delete The Pay Items and replace by:

<table>
<thead>
<tr>
<th>Pay Items</th>
<th>Unit of Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.07 Subgrade Layer (Topping)</td>
<td>Cubic Meter</td>
</tr>
</tbody>
</table>
PART 3 SUBBASE AND BASE COURSES

SECTION 3.01 MATERIALS

3.01.3 Granular Material for Sub-base

- Add the following at the end of Clause No. 4:

In the specified sand equivalent value corresponds to the value obtained in accordance with AASHTO T. 176 (Dry method), for the material in dry condition.

- Replace the Clause 5 as follows:

5. The loss in weight of granular material shall not exceed 40% after 500 revolutions, when tested in accordance with AASHTO T96 (Los Angeles Abrasion Test).

\[
\text{The ratio of wear loss} = \frac{\text{Abrasion after 100 Rev.}}{\text{Abrasion after 500 Rev.}}
\]

Should not be more than 0.20

- Add the following new clauses:

10. The fractions of material passing the No. 200 mesh sieve shall not be greater than 67% of the fractions passing the No. 40 mesh sieve.

11. Chert content (determined as percentage by weight insoluble in hydrochloric acid) for sub-base material shall be within reasonable limits which will not affect the formation of intact cohesive surface.

3.01.4 Aggregate for Base Courses

- Delete Table 3.2: Gradation of Base Coarse Aggregate by Class should be revised to read as follows:

<table>
<thead>
<tr>
<th>Sieve Designation, mm</th>
<th>Class A, % Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.5</td>
<td>100</td>
</tr>
<tr>
<td>25</td>
<td>85-100</td>
</tr>
<tr>
<td>19</td>
<td>60-90</td>
</tr>
<tr>
<td>12.5</td>
<td>45-80</td>
</tr>
<tr>
<td>9.5</td>
<td>40-70</td>
</tr>
<tr>
<td>4.75</td>
<td>30-55</td>
</tr>
<tr>
<td>2</td>
<td>20-40</td>
</tr>
<tr>
<td>0.425</td>
<td>8-20</td>
</tr>
<tr>
<td>0.075</td>
<td>5-10</td>
</tr>
</tbody>
</table>

- Add the following at the end of Clause No.5:

The specified sand equivalent value corresponds to the value obtained in accordance with
AASHTO T. 176 (Dry method). If the test is carried out in accordance with AASHTO T 176 (Wet Method), the Contractor shall establish a correlation between the two tests.

- In Clause (6), amend the following:
  a. In the first line, delete “45%” and replace by “40%”
  b. Delete the third and fourth lines and replace by the following:

\[
\text{The ratio of wear loss} = \frac{\text{Abrasion after 100 Rev.}}{\text{Abrasion after 500 Rev.}}
\]

Should not be more than 0.25, and the abrasion loss after 100 revolutions not to exceed 8%, and 40% after 500 revolutions.

- Replace the first sentence in Clause (9) by:

9. The portion of aggregate, including any blend material, passing the 0.425mm (No. 40) mesh sieve shall have a liquid limit (L.L) of not more than 25 and plasticity index (P.I) of not more than 6 when tested in accordance with AASHTO T90.

- Add the following new clauses:

11. The fractions of material passing the No. 200 mesh sieve shall not be greater than 67% of the fractions passing the No. 40 mesh sieve.

12. Chert content (determined as percentage by weight insoluble in hydrochloric acid) for base course material shall be within reasonable limits which will not affect the formation of intact cohesive surface. Usually less than 5% and to the approval of the Engineer.

SECTION 3.02 GRANULAR SUBBASE COURSES

3.02.6 Construction

- Add item 4.6 to read as follows:

4.6 The elevations of subbase layer shall be checked out using a level instrument of 1 mm double run accuracy.

SECTION 3.03 AGGREGATE BASE COURSES

3.03.6 Construction

- Revise the first sentence to read: “All components of base course material shall be mixed thoroughly and uniformly with water in a pugmill mixing plant.”

- Add the following paragraphs to the end of Clause 2.1.
Aggregate base course material shall be collected in a stockpile with suitable heights that will not cause any segregation. The base course material shall be transferred from the stockpile by a shovel to a stationary plant which consists of the following or similar approved plant:

- A cold bin with revolving blades to mix base course material before transferring it by a conveyor (BEH) to a pugmill (with or without rotary blades), adding water by a water sprayer to achieve a uniform moisture content with +2.0% of the optimum moisture content.

- Or a cold bin without revolving blades that can transfer the mixed material to a pug mill mixing plant with revolving blades or rotary drum or a continuous mixing type.

The rate of feed shall not exceed that which will permit complete mixing of all the material.

After mixing, the material shall be transferred to the trucks which will transfer the material to a self-propelled finisher, equipped with mechanical vibrator with rotary blades that will mix the base course material again to prevent any segregation and spread the material to the required width.

- Revise Clause 2.4 to read:

  “The base course material shall be placed to the required width using a self-propelled spreader (finisher) and shall be delivered such that it is ready for compaction without further shaping.

  The finisher shall be equipped with a sensor that runs on a string line or a 6.0 m skid to spread the base course evenly to the required elevation. Immediately upon completion of spreading to the required shape and elevation, the mix shall be compacted using approved rollers to achieve the required compaction density. Rolling should start immediately after spreading to avoid moisture loss.

  The elevation of the sensor wire shall be established based on-site trials that will be made to measure the difference between the loose thickness and compacted thickness in order to define the elevation of the sensor wire accordingly.”

For transverse joints during construction, the end of constructed lane should be prepared and cleaned to form a vertical face to the required compacted thickness; the finisher screed should be placed on it but at the required thickness of the loose new materials to achieve continuity of surface elevation.

- Replace Items No 4.2 and 4.4 by:

  4.2 The elevations of the finished base course shall be checked by the Contractor in the presence of the Engineer at intervals of 10 m and its intermediate points as directed.

  4.4 When the finished surface is tested with a 4m long straightedge, placed parallel to, or at right to the centerline, the maximum deviation of the surface from the testing edge between any 2 contact points shall not exceed 10 mm.
PART 4     BITUMINOUS CONSTRUCTION

SECTION 4.01    MATERIALS

4.01.3 Aggregates for Bituminous Paving Mixes

- Amend Clause 1 to read as follows:
- Aggregate for use in bituminous base course, binder course, levelling course, and macadam and cold mix courses, shall consist of crushed stone.

The coarse fraction of aggregate for use in bituminous wearing course shall consist of crushed stone from high quality Basalt. Vesicular particles shall not exceed 5.0% by weight.

- Replace Clause 7 by

6. Aggregate particles shall be clean, hard, durable, and sound. Crushing shall result in a product such that for particles retained on 4.75 mm (No. 4) sieve, at least 90% by weight shall have 2 or more newly fractured faces.

- Replace Clause 11 by

11. Combined coarse and fine aggregates for bituminous mixes, including mineral filler, when tested in accordance with AASHTO T 27 and T11, shall conform to the gradations shown in Table 4.1.

Table 4.1 Gradation of Aggregates for Bituminous Mixes

<table>
<thead>
<tr>
<th>Sieve Designation</th>
<th>Heavy Traffic*</th>
<th>Light Traffic**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Binder Course</td>
<td>Wearing Course</td>
</tr>
<tr>
<td>1 1/2” (25.0mm)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1” (19.0mm)</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>3/4” (12.5mm)</td>
<td>70-100</td>
<td>90-100</td>
</tr>
<tr>
<td>1/2” (9.5mm)</td>
<td>53-90</td>
<td>71-90</td>
</tr>
<tr>
<td>3/8” (4.75mm)</td>
<td>40-80</td>
<td>56-80</td>
</tr>
<tr>
<td>No.4 (2.36mm)</td>
<td>30-56</td>
<td>35-56</td>
</tr>
<tr>
<td>No.8 (1.18mm)</td>
<td>23-38</td>
<td>23-38</td>
</tr>
<tr>
<td>No.20 (0.300mm)</td>
<td>13-27</td>
<td>13-27</td>
</tr>
<tr>
<td>No.50 (0.150mm)</td>
<td>5-17</td>
<td>5-17</td>
</tr>
<tr>
<td>No.80 (0.075mm)</td>
<td>4-14</td>
<td>4-14</td>
</tr>
<tr>
<td>No.200 (0.075mm)</td>
<td>2-8</td>
<td>2-8</td>
</tr>
</tbody>
</table>

* To be used for the main roads and parking areas.
** To be used for temporary roads and detours
- Amend Clause No. 12 to read as follows: -

12. The loss in weight of aggregate after 500 revolutions, when tested in accordance with AASHTO T 96, shall not exceed 25% for bituminous wearing course layer and 35% for bituminous binder course layer.

\[
\text{Abrasion after 100 Rev.} \\
\text{Ratio of wear loss = } \frac{\text{Abrasion after 100 Rev.}}{\text{Abrasion after 500 Rev.}}
\]

Less than or equal 0.25

- Add the following new Clauses

16. Polish Stone Value of coarse aggregate used in wearing course mix, when tested in accordance with BS 812, shall be at least 60%

17. The water absorption of the coarse basalt aggregate material shall not exceed 2%.

18. The aggregate material shall have chloride content of less than 0.8 percent and sulphate content of less than 0.30 percent when tested in accordance with BS-812.

SECTION 4.02 BITUMEN PRIME AND TACK COATS

4.02.2 Materials

- Clause 2 “Rapid – Curing (RC) Cutback Bitumen”, replace 2.1 to the following:

2.1 RC cutback bitumen (for tack coat) shall be grade RC250 and as specified in section 4.01 “Material”.

4.02.6 Measurement

- Add the following Pay Item:

<table>
<thead>
<tr>
<th>Pay Items</th>
<th>Unit of Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.02(1) Bituminous Prime Coat MC-70, application rate from 0.75 to 2 Kg/m²</td>
<td>Ton</td>
</tr>
</tbody>
</table>

SECTION 4.03 BITUMINOUS COURSES

4.03.5 Construction of Trial Sections

- Add Clause 6 as follows:

6. The trial section shall commence immediately after the completion of the design mix stage at least one month before actual production. If the initial trial section should prove to be unacceptable, the necessary adjustments to the Job Mix Formula, plant operation, placing
procedures, and/or rolling procedures shall be made. A second trial section shall then be placed. Additional trial sections, as required, shall be constructed, and evaluated for conformance to the specifications. Full production shall not begin until an acceptable section has been constructed and accepted.

SECTION 4.05 BITUMINOUS BINDER AND WEARING COURSE

4.05.2 Materials

- Add Clauses 4 and 5 as follows:

4. The bitumen for bituminous wearing course layer shall meet the requirements for performance graded bitumen Grade 60-70.

4.05.3 Job Mix and Project Mix

- Replace Clauses 2 to 4 and Table 4.15 by the below Clauses:

2. The job mix shall be composed of a mixture of aggregate, filler, and bituminous material.

3. The several aggregate fractions shall be combined in such proportions that the resulting mixture meets the grading requirements of the Job Mix Formula (JMF)

4. Job Mix Formula:

4.1 No asphalt mixture for pavements shall be produced until a job mix formula has been approved by the Engineer. Details of JMF shall be submitted at least 15 days prior to first trials.

4.2 The Job Mix Formula shall be determined based on volumetric mix design according to the Asphalt Institute’s Manual (MS-2).

4.3 The field laboratory to be used shall be capable of performing all the tests required by this Section.

4.4 The gradation given in Table 4.1 and 4.1A of Section 4.01 represents the limits that shall determine the suitability of aggregates for use in the course of supply.

4.5 Marshall design criteria:
### Table 4.15 Marshall Design Criteria

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Requirement for Bituminous Binder Course Layer</th>
<th>Requirement for Bituminous Wearing Course Layer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Blows at each end of the specimen</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Stability, in Newton</td>
<td>&gt;10,000</td>
<td>&gt; 12,000</td>
</tr>
<tr>
<td>Flow, in mm</td>
<td>2 – 4</td>
<td>2 – 4</td>
</tr>
<tr>
<td>Air Voids, percent</td>
<td>4 – 7</td>
<td>3 – 6</td>
</tr>
<tr>
<td>Loss of Marshall Stability* in accordance with AASHTO T165</td>
<td>Max. 25%</td>
<td>Max. 25%</td>
</tr>
<tr>
<td>Marshall Quotient, /mm (-Stability / Flow)</td>
<td>4900</td>
<td>4900 min.</td>
</tr>
<tr>
<td>Percent Voids in Mineral Aggregate (VMA)</td>
<td>Min 13</td>
<td>Min 14</td>
</tr>
<tr>
<td>Filler/Bitumen Ratio, by weight</td>
<td>0.6 – 1.2</td>
<td>0.6 – 1.2</td>
</tr>
<tr>
<td>Air Voids at Refusal**, percent</td>
<td>2 minimum</td>
<td>2 minimum</td>
</tr>
</tbody>
</table>

* The loss of Stability shall not be more than 25 percent determined as follows:

Submerge samples in water at 60 deg. C for 30 minutes and determine Marshall Stability – result (a).
Submerge samples in water at 60 deg. C for 24 hours – result (b).
Loss of Stability is (a – b)/a x 100 percent.

** The refusal condition shall be achieved by compacting samples with increasing number of blows in the Marshall procedure until no further densification occurs. The sequence of blows recommended to determine the refusal condition is 75 blows, 200 blows, 300 blows, 400 blows, and 600 blows.

- Add the following Clauses to subsection 4.05.3:

5. Bitumen content shall be calculated by weight of total mixture excluding absorption. The range of bitumen content by weight of total mix to be added to the mix is indicated below:

<table>
<thead>
<tr>
<th>Pavement Course</th>
<th>Bitumen Content (percentage by weight of total mixture)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binder</td>
<td>3.5 to 5.0</td>
</tr>
<tr>
<td>Wearing</td>
<td>3.5 to 5.0</td>
</tr>
</tbody>
</table>

These values are guidelines only. The minimum binder content shall be selected consistent with achieving the void content, durability, and mechanical property requirements.
6. When tested for resistance to water damage in accordance with AASHTO T 283 “Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage”, the bituminous wearing course mixture shall have a retained tensile strength greater than or at least equal to 80%. In case the anti-stripping agents are not successful in providing the specified Tensile Strength Ratio, then the Contractor shall consider alternative means, such as the use of hydrated lime to achieve this purpose.

7. Surface texture: An average surface texture depth in the asphalt course of 0.9mm shall be achieved when tested according to the sand patch test to ASTM E 965, with no values below the minimum limit of 0.72mm. Mix proportions shall be performed by the Contractor to optimize the asphalt wearing course mix design taking into consideration the surface texture requirements.

4.05.9 SAMPLING AND TESTING

1. Sampling and testing shall conform to the relevant requirements of section 1.05 “Control of Materials and Standards for sampling and Testing”.

Table 4.13 Tests for Bituminous Pavements
Minimum Tests Required: Table 4.13 should be replaced by Table 4 in Clause 0.5 of these particular specifications.

4.05.10 SURFACE TOLERANCES

- Amend Clause 2 to read as follows: -

2. The Tolerances on elevations of the final bituminous wearing and binder course surfaces shall not be greater than 10mm.

- Amend Clause 3 to read as follows: -

3. When the finished wearing and binder course surfaces are tested with a 3 m long straightedge, placed parallel to, or at right angles to the centerline, the maximum deviation of the surface from the testing edge between any 2 contact points shall not exceed 3 mm and 4 mm, respectively.

- Add the following new clause:

Measurement

Bituminous Wearing course shall be measured by sq.m of mix furnished, Spread, Compacted, completed, and accepted Measurements shall be of the areas and thickness as shown on the Drawings and BOQs.

- Add the following Pay Item:

<table>
<thead>
<tr>
<th>Pay Items</th>
<th>Unit of Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.05(1) Bituminous wearing Course, 4cm thick</td>
<td>Sq.M</td>
</tr>
<tr>
<td>(Compacted Thickness), Dimensions measured from the top of layer.</td>
<td></td>
</tr>
</tbody>
</table>
PART 5 CONCRETE, STEEL AND STRUCTURES

SECTION 5.01 CONCRETE AND CONCRETE MIXES AND TESTING

5.01.2 Material

- Item 4.2.5, Correct this item to read as follows: -
  4.2.5 Aggregate abrasion value by the Los Angeles test in accordance with AASHTO T96-83, ASTM C131-81, and ASTM C535-81.

- Item 5.4, Correct this item to read as follows: -
  5.4 Fine aggregate shall meet the requirements specified under this item of the Standard Specifications.

- Item 6.3, Correct this item to read as follows: -
  6.3 Coarse aggregates shall meet the requirements specified under this item of the Standard Specifications.

- Item 6.4, Delete and replace by:
  6.4 The grading of coarse aggregates shall comply with Table 1 of JSS/96/1987 or to AASHTO M43 or as per the Engineer’s directions.

5.01.5 Requirements for design mixes

    Table 5.5.A:

    - Change the maximum free water/cement ratio in very severe exposure from 0.45 to 0.40.

5.01.8 Measurement

    - Delete Items 2.3 and 2.4 and substitute by the following:

      2.3 Measurement and payment shall be based upon different classes of concrete as stated in the BOQ irrespective of type of form and/or false work and irrespective of class of surface finish.

    - Renumber Items 2.5 and 2.6 as 2.4 and 2.5 respectively.

    4. Inclusion in the Rates

    Add the following:

    4.1.16 Backfill drains, shear key, induced contraction and expansion joints and any other items shown in the drawings.

    4.1.17 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, voids formers and its fixing ancillaries, sealants, expoy (mortar, resin, or adhesive paint), water stops, utility dusks, weep holes, voids vents, base course, and polyethylene under approach slab.

- Add the following new clause:

5 Payment

The Payment Items for the Bill of Quantities under which the works in this section and other related sections of the Specifications shall be paid for, are as listed hereinafter. Measurement for payment shall be made according to the units of measurement stated in the Bill of Quantities.

Prices and payment for the Pay Items shall be deemed to include all that is required to complete the work according to this section and other sections of the Specifications, including all incidentals and subsidiary work which have no separate items for payment in the Bill of Quantities.

Unless it is explicitly specified in the specification or the drawings and a separate Item is included in the BOQ, the rate for any concrete class shall deemed to include the following:

1. Fair Face surface finish,
2. Formwork,
3. Provision and installation of joint filler,
4. Weep holes at wing walls.
5. Expansion joints, construction joints and contraction joints for all structures,
6. All other miscellaneous details shown on the Drawings.

SECTION 5.02 CONCRETE HANDLING, PLACING AND CURING

5.02.6 Hot Weather Concrete

- Clause 2, Delete item 2.2 and substitute by the following:

2.2 In the absence of an alternative procedure proposed by the Contractor and approved by the Engineer in order to control the concrete mix temperature, no concreting shall commence when the air temperature is 32° C and rising. However, the Contractor may schedule his operations to commence pouring concrete during the hours that the air temperature is 34°C maximum but dropping at late hours of the day.

SECTION 5.03 STEEL REINFORCEMENT AND FIXING

5.03.2 Materials

- Delete item 1.1 and substitute by the following:

1.1 Hot rolled steel bars shall conform to JSS/441/1994 or to AASHTO M31M (ASTM A615M) or to B.S. 4449.
SECTION 5.04 FORMS, FORM WORK AND FALSEWORK

Sub-Section 5.04.1 SCOPE

Add and amend as follows:

2. Special Coating System for the Projection of Exposed Concrete Surfaces Shall be used in this Project:

2.1 General
The coating system shall be an elastomeric system of single component products, a weather resistant topcoat used in conjunction with a penetrating primer. The Coating shall have the ability to provide in-depth protection for reinforced concrete structures against corrosion associated with the ingress of chloride and sulphate ions, carbon dioxide and other air-borne acid gases, and shall have ‘the ability to allow water vapor to escape from the structure.

2.2 Prime
The primer shall be a low viscosity reactive silane-siloxane/acrylic blend dissolved in a penetrating organic carrier. The primer shall have the capability to penetrate and produce a chemically bound Hydrophobic barrier to prevent the passage of chloride and sulphate ions. The primer should also be film forming to condition and stabilize the substrate prior to the application of the topcoat. The primer should be applied in full accordance with the manufacturer instructions.

2.3 Topcoat
The topcoat shall be a fiber reinforced pure aliphatic acrylic resin, decorative, high-performance water based, pigmented coating. It shall have resistance to water, carbon dioxide and other air-borne acids and have the ability to allow the passage of water vapor from within the structure.

2.4 The topcoat shall have elastomeric and flexural capabilities and should be applied in strict accordance with the manufacturer's instructions. Approved make DURA GARD HY-BUILD, FOSROC or MBT or equal approved.

2.5 The system will, during trials, display the following properties when applied in accordance with the manufacturer's specification to samples obtained from concrete made without additives.

Reduction in Water Absorption (measured against a control concrete sample in accordance with ASTM C 642)
Reduction in Chloride Ion Penetration measured in accordance with ASTM C 1202-97

Water Vapour Transmission
Method of testing and interpretation of results shall be subject to approval of Engineer and DCL

> 13g/m²/day

90% minimum at 28 days
2.6 **Trial Panels**

Prior to applying the system in the works, trial applications shall be carried out on trial panels made by the Contractor under Clause 4/33. The trials will demonstrate the method proposed for applying the system, coverage, coating thickness, color and final appearance of the coating. Representatives of the coating manufacturers shall be present at the trials and the surface preparation and application of the coating shall be carried out under their direction. The Contractor shall at his own expense surface coat as many panels as required by the Engineer until a trial panel has been accepted by the Engineer as satisfactory. The coated panel, when accepted, will form the standard against which the corresponding coating in the works will be judged. No application of the coating in the works shall be undertaken until trials have been completed to the Engineer’s satisfaction.

2.7 **Inspection of Concrete**

The Contractor shall not proceed with the surface finish or making good of concrete surfaces until he has received the Engineer’s Representative’s permission to do so, and he shall not apply cement slurry or mortar or any other coating to the concrete surfaces from which the shuttering has been struck until the concrete has been inspected and approved by the Engineer’s Representative.

2.8 **Faulty Concrete Work**

The Contractor shall on the written instruction of the Engineer remove and reconstruct any such portion of the work which in the opinion of the Engineer is unsatisfactory as regards quality of concrete, incorrect dimension of the cast portion, badly placed or insufficient reinforcement, honeycombing or other such cause as shall render the construction not up to the standard required and which in the opinion of the Engineer may prejudicially affect the strength or durability of the construction.

2.9 **Approval Prior to Coating Application in the Works**:

The Engineer’s approval must be obtained prior to applying the coating system in the works. Before approval is given the Engineer will need to be satisfied as to the following:

i. All construction work in the immediate vicinity of the structure to be coated has been completed.

ii. The surface preparation of the structure has been completed.

iii. The whole of the structure can be coated in a continuous operation.

iv. Adequate measures have been taken to protect the property of third parties, including vehicles, from coating splatters.

v. The weather conditions accord with the coating manufacturer’s directions for coating application.
SECTION 5.13 PIPE CULVERTS, STORM DRAINS, AND UTILITY DUCTS

5.13.4 Measurement

- Delete Clauses 1,2 and replace by:

1. Pipe Culverts, shall be measured by linear meter of each pipe size and type furnished, installed, or constructed, including excavation, embedment, pipe culvert, backfilling, encasement, concrete for head & wing walls, reinforcement and all that is needed to complete the work as per Drawings.

2. Measurement of pipes for pipe culvert shall be made as per B.O.Q items. The length measured shall extend from end to end of pipe in the absence of headwall or end walls or shall extend between inside (Highway) faces of headwall and end wall.

Add the following new clause:

12- Storm Trapezoidal Ditch at Ring Road shall be measured by linear meter, the price includes all required cleaning, grubbing (preparing the surface to receive the proposed concrete ditch by removing the existing roots, vegetation, stones and rocks and all other protruding debris, etc.), excavation, backfilling, concrete class 25, steel reinforcement and all that is needed to complete the work as per Drawings.

13- V Shape Ditch with (0.4-0.6) m width and (0.2-0.3) m depth, the price includes backfilling, concrete class 20, plastic sheet 250 micron and all that is needed to complete the work as per Drawings.

Excavation Quantities shall be measured by Cu.m of "Unclassified Highway Excavation" item.

14- Trapezoidal Ditch inside project boundary (Districts 2 and 12) except the channel at ring road the price includes all required cleaning, grubbing (preparing the surface to receive the proposed concrete ditch by removing the existing roots, vegetation, stones and rocks and all other protruding debris, etc.), excavation, backfilling, concrete class 25 and all that is needed to complete the work as per Drawings. (Width and Depth of Trapezoidal Ditches are variable according to site condition).

15- Reinforced Concrete class (25) for head walls and apron, and class 15 concrete for blinding shall be measured and paid for as prescribed in section 5.01 and as shown in drawings.

16- 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, equipment and incidentals necessary to complete the work described in this section.

Pay Items as illustrated in BoQs.