



Republic of the Philippines  
**Tourism Infrastructure & Enterprise Zone Authority**

**GENERAL SPECIFICATIONS**

**I. GENERAL CONDITIONS**

The work to be undertaken shall include the furnishing of labor, materials, tools and equipment for the following:

Project: **DEVELOPMENT OF SAN VICENTE FLAGSHIP TEZ LONG BEACH  
ACCESS ROAD PROJECT**  
Location: **San Vicente, Palawan**

**A. Scope of Work**

The construction work must be executed strictly in accordance with the plans and specifications. The following principal items of work shall include but not limited to the following:

- 1. GENERAL REQUIREMENTS**
- 2. MOBILIZATION/DEMOBILIZATION**
- 3. SERVICE VEHICLE**
- 4. ROAD 1**
  - i. Item 102(2)b – Surplus Common Excavation
  - ii. Item 200(1) – Aggregate Subbase Course
  - iii. Item 300(1) – Gravel Surface Course
  - iv. Item 311(1)c3 – PCC Pavement (Unreinforced)  $t=0.23m$ , 3 Days
- 5. ROAD 2**
  - i. Item 102(2)b – Surplus Common Excavation
  - ii. Item 200(1) – Aggregate Subbase Course
  - iii. Item 300(1) – Gravel Surface Course
  - iv. Item 311(1)c3 – PCC Pavement (Unreinforced)  $t=0.23m$ , 3 Days
- 6. ROAD 3**
  - i. Item 102(2)b – Surplus Common Excavation
  - ii. Item 200(1) – Aggregate Subbase Course
  - iii. Item 300(1) – Gravel Surface Course
  - iv. Item 311(1)c3 – PCC Pavement (Unreinforced)  $t=0.23m$ , 3 Days
- 7. ROAD 5**
  - i. Item 102(2)b – Surplus Common Excavation
  - ii. Item 200(1) – Aggregate Subbase Course
  - iii. Item 300(1) – Gravel Surface Course
  - iv. Item 311(1)c3 – PCC Pavement (Unreinforced)  $t=0.23m$ , 3 Days
- 8. ROAD 6**
  - i. Item 102(2)b – Surplus Common Excavation
  - ii. Item 200(1) – Aggregate Subbase Course
  - iii. Item 300(1) – Gravel Surface Course
  - iv. Item 311(1)c3 – PCC Pavement (Unreinforced)  $t=0.23m$ , 3 Days
- 9. ROAD 7&8**
  - i. Item 102(2)b – Surplus Common Excavation

- ii. Item 200(1) – Aggregate Subbase Course
  - iii. Item 300(1) – Gravel Surface Course
  - iv. Item 311(1)c3 – PCC Pavement (Unreinforced)  $t=0.23m$ , 3 Days
- 10. BOX CULVERT**
- i. Earthworks
  - ii. Concrete Works
  - iii. Reinforcing Steel Bars
  - iv. Formworks

The construction procedures shall be done in accordance with the DPWH Standard Specifications, and in full compliance with the approved plans and specifications.

All items not specifically mentioned in the specifications or noted on the plans but which are obviously necessary for the completion of the work shall be included.

## **II. GENERAL REQUIREMENTS**

### **A. Occupational Safety and Health Program**

#### **1. General**

All security and health controls necessary for the execution of the Works such as but not limited to, medical facilities, manpower safety gadgets, sanitary arrangements, explosives and fuel, temporary fencing, safety precautions and fire prevention, shall be established and maintained by the Contractor at his own expense. The Contractor shall make himself responsible for all security and health controls and shall submit to the Engineer for his approval the organization and the regulations for these purposes.

#### **2. Site Security**

The Contractor's warehouse and storage area shall be secured against unauthorized entry in a manner appropriate to its contents. The Contractor shall also provide watchmen as required.

#### **3. Sanitary Arrangement**

The Contractor shall keep the Site in a clean and sanitary condition and shall provide and maintain sanitary facilities for the use of persons employed in the Works to the extent and in the manner and at such places as approved by the Engineer and by any local or other authorities concerned, and all persons connected with the Works shall be obliged to use these sanitary facilities.

The Contractor shall also post notices and take such other precautions as may be necessary to keep the Site clean and well maintained.

#### **4. Medical Facilities**

The Contractor shall make his own arrangement for treatment of casualties on the Site in conformity with the requirements of any duly constituted medical and sanitary authority. The Contractor shall provide first aid units/stations, and shall be responsible for and bear all cost in connection with the first aid services including the use of ambulance of injured or sick employees transporting to the hospital. Such first aid services shall be provided to the Employer, the Engineer, and to their employees at the site at no cost to them.

## 5. Dangerous Materials

The Contractor shall convey, store and make use of all, petroleum, acetylene carbide, acetylene carbide of calcium and other similar dangerous materials provided by them for use in or on the Works in strict accordance with the provision of all Laws, Orders and Regulations that are in force at the Site or that may be issued from time to time by the Government or the Employer.

## 6. Precaution For Safety

The Contractor shall take all necessary precautions against risks, loss of life or of injury to any person employed on the Works or to employees of the Employer and the Engineer or to visitors or to persons having good and sufficient reasons to be about the Works, and shall properly safeguard the Works to the satisfaction of the Engineer.

Where and when it is deemed necessary, the Contractor shall furnish lighting facilities, signs and sentry, and other safety facilities and services.

The Contractor shall provide their Workers, Supervisors, Engineers, and Owner's and Engineer's representatives the necessary safety gadgets at the site such as: safety shoes, safety helmets, safety belts, gloves, goggles, gas or dust mask, and Uniforms,

The Contractor shall furthermore take all necessary precautions against damage to the property of the Employer or of others located at or adjacent to the Site. The Contractor shall at all times comply with any accident prevention, regulations and any safety regulations of local or national authorities or that shall be prescribed by the Employer.

The Contractor shall appoint a Safety Officer and hold periodical safety meetings with the Engineer and with his own supervisors and foremen. The Contractor shall report in writing within twenty-four (24) hours to the Engineer all accidents involving the death of and/or injury to any person, resulting from the Contractor's operation.

## 7. Fire Prevention

The Contractor shall take every precaution to prevent fire occurring on or about the Site and shall provide firefighting equipment suitable and adequate in the opinion of the Engineer, for ready use in all structures, buildings or the Works under construction, including his residential quarters, labor camps and ancillary buildings. The Contractor shall maintain such equipment and such additional firefighting equipment as may be required, in good working condition until the Works are accepted by the Employer.

The Contractor shall diligently fight any fire which occurs on the Site, wherever such fire may originate. In this regard, he shall employ all requisite equipment and manpower up to the limit of his equipment and manpower employed at the Site, including the equipment and manpower of his Subcontractors.

## B. Traffic Management

### 1. General

The Contractor shall implement an approved Traffic Management Plan. At least 7 days prior to commencing work on the Site, the Contractor shall submit to the Engineer for approval a detailed plan covering all aspects of traffic management for each stage of the Works. The submission shall include documentation evidencing approval by all relevant authorities. No work shall commence on any work stage until the Engineer has approved the plan for that stage. Upon the Engineer's approval, the Contractor shall immediately implement the plan and keep it in operation for the full duration of the relevant work stage.

The Contractor shall be responsible at all times for the safety of the public on the Site and, should the Contractor fail to provide the necessary traffic management, the Engineer may arrange for others to carry out such work as he deems to be necessary. The Contractor shall be responsible for the cost of the necessary work and the Employer may recover this by deduction from any money due, or which may become due, to the Contractor under the Contract.

### 2. Traffic Arrangement

The Contractor shall make provision for the safe movement of all road users at all times and shall ensure that all traffic control and road closure or diversion signposting work which is required shall comply with the requirements of the relevant authorities.

The Contractor shall plan and implement the construction of the work such that public traffic may continue to pass safely along the affected roads at all times.

Where the safe movement of road users may be affected, the Contractor shall ensure that all necessary traffic control and road closure or diversion signposting work is provided to the satisfaction of the Engineer and the relevant authorities.

Where required, or where instructed, the Contractor shall furnish and station competent flagmen whose sole duties consist of directing the movement of traffic through or around the work.

All necessary traffic safety and management measures shall be fully operational before the Contractor commences any work that affects public roads.

### 3. Compliance with Instructions

The Contractor shall comply with any direction or instruction given by the Engineer or a relevant authority in respect of any traffic control proposal.

The Engineer or a relevant authority may at any time instruct the Contractor to re-open any traffic lane or shoulder to traffic without delay, whether or not closed by prior agreement.

The Engineer may order suspension, or cessation, of any activity that causes delay to traffic or threatens the safety of the public, notwithstanding that approval had previously been given to the traffic change.

### C. Mobilization & Demobilization

Mobilization shall include transportation to the site of Contractor's plant, materials, equipment, employees, furnishings and temporary facilities.

Mobilization, as provided in these Specifications, means preparatory work and operations, including, but not limited to, those necessary for the movement of necessary personnel, plant and equipment to the Site.

Demobilization shall include dismantling and removal from the site of Contractor's plant, materials and equipment and all temporary facilities. It shall also include cleanup of the site after completion of the Contract Work as approved by the Engineer and transportation from the site of Contractor's employees.

The Contractor shall furnish the Engineer with a resources schedule, showing in detail the sequence of proposed delivery to the Site of plant and equipment necessary to comply with the proposed construction program.

The Contractor shall keep the Engineer informed of the arrival of plant and equipment on the Site.

In accordance with the Conditions of Contract, the Contractor shall not remove construction plant and equipment from the Site without the approval of the Engineer

## **III. EARTHWORKS**

### **ITEM 102 – EXCAVATION**

#### 102.1 Description

This Item shall consist of roadway drainage and borrow excavation, and the disposal of material in accordance with this Specification and in conformity with the lines, grades and dimensions shown on the Plans or established by the Engineer.

##### 102.1.1 Roadway Excavation

Roadway excavation will include excavation and grading for roadways, parking areas, intersections, approaches, slope rounding, benching, waterways and ditches; removal of unsuitable material from the roadbed and beneath embankment areas; and excavating selected material found in the roadway as ordered by the Engineer for specific use in the improvement. Roadway excavation will be classified as "unclassified excavation", "rock excavation", "common excavation", or "muck excavation" as indicated in the Bill of Quantities and hereinafter described.

(1) **Unclassified Excavation.** Unclassified excavation shall consist of the excavation and disposal of all materials regardless of its nature, not classified and included in the Bill of Quantities under other pay items.

(2) **Rock Excavation.** Rock excavation shall consist of excavation of igneous, sedimentary and metamorphic rocks which cannot be excavated without blasting or the use of rippers, and all boulders or other detached stones each having a volume of 1 cubic meter or more as determined by physical measurements or visually by the Engineer.

(3) **Common Excavation.** Common excavations shall consist of all excavation not included in the Bill of Quantities under "rock excavation" or other pay items.

(4) **Muck Excavation.** Muck excavation shall consist of the removal and disposal of deposits of saturated or unsaturated mixtures of soils and organic matter not suitable for foundation materials regardless of moisture content.

#### 102.1.2 Borrow Excavation

Borrow excavation shall consist of the excavation and utilization of approved materials required for the construction of embankments or for other portions of the work, and shall be obtained from approved sources, in accordance with Clause 61, Standard Specifications for Public Works and Highways, Volume I and the following:

(1) Borrow, Case 1

Borrow Case 1 will consist of material obtained from sources designated on the Plans or in the Special Provisions.

(2) Borrow, Case 2

Borrow Case 2 will consist of material obtained from sources provided by the Contractor.

The material shall meet the quality requirements determined by the Engineer unless otherwise provided in the Contract.

#### 102.2 Construction Requirements

##### 102.2.1 General

When there is evidence of discrepancies on the actual elevations and that shown on the Plans, a pre-construction survey referred to the datum plane used in the approved Plan shall be undertaken by the Contractor under the control of the Engineer to serve as basis for the computation of the actual volume of the excavated materials.

All excavations shall be finished to reasonably smooth and uniform surfaces. No materials shall be wasted without authority of the Engineer. Excavation operations shall be conducted so that material outside of the limits of slopes will not be disturbed. Prior to excavation, all necessary clearing and grubbing in that area shall have been performed in accordance with Item 100, Clearing and Grubbing.

### 102.2.2 Conservation of Topsoil

Where provided for on the Plans or in the Special Provisions, suitable topsoil encountered in excavation and on areas where embankment is to be placed shall be removed to such extent and to such depth as the Engineer may direct. The removed topsoil shall be transported and deposited in storage piles at locations approved by the Engineer. The topsoil shall be completely removed to the required depth from any designated area prior to the beginning of regular excavation or embankment work in the area and shall be kept separate from other excavated materials for later use.

### 102.2.3 Utilization of Excavated Materials

All suitable materials removed from the excavation shall be used in the formation of the embankment, subgrade, shoulders, slopes, bedding, and backfill for structures, and for other purposes shown on the Plans or as directed.

The Engineer will designate as unsuitable those soils that cannot be properly compacted in embankments. All unsuitable materials shall be disposed off as shown on the Plans or as directed without delay to the Contractor.

Only approved materials shall be used in the construction of embankments and backfills.

All excess materials, including rock and boulders that cannot be used in embankments shall be disposed off as directed.

Materials encountered in the excavation and determined by the Engineer as suitable for topping, road finishing, slope protection, or other purposes shall be conserved and utilized as directed by the Engineer.

Borrow materials shall not be placed until after the readily accessible materials from roadway excavation has been placed in the fill, unless otherwise permitted or directed by the Engineer. If the Contractor places more borrow than is required and thereby causes a waste of excavation, the amount of such waste will be deducted from the borrow volume.

### 102.2.4 Prewatering

Excavation areas and borrow pits may be prewatered before excavating the material. When prewatering is used, the areas to be excavated shall be moistened to the full depth, from the surface to the bottom of the excavation. The water shall be controlled so that the excavated material will contain the proper moisture to permit compaction to the specified density with the use of standard compacting equipment. Prewatering shall be supplemented where necessary, by truck watering units, to ensure that the embankment material contains the proper moisture at the time of compaction.

The Contractor shall provide drilling equipment capable of suitably checking the moisture penetration to the full depth of the excavation.

### 102.2.5 Presplitting

Unless otherwise provided in the Contract, rock excavation which requires drilling and shooting shall be presplit.

Presplitting to obtain faces in the rock and shale formations shall be performed by: (1) drilling holes at uniform intervals along the slope lines, (2) loading and stemming the holes with appropriate explosives and stemming material, and (3) detonating the holes simultaneously.

Prior to starting drilling operations for presplitting, the Contractor shall furnish the Engineer a plan outlining the position of all drill holes, depth of drilling, type of explosives to be used, loading pattern and sequence of firing. The drilling and blasting plan is for record purposes only and will not absolve the Contractor of his responsibility for using proper drilling and blasting procedures. Controlled blasting shall begin with a short test section of a length approved by the Engineer. The test section shall be presplit, production drilled and blasted and sufficient material excavated whereby the Engineer can determine if the Contractor's methods are satisfactory. The Engineer may order discontinuance of the presplitting when he determines that the materials encountered have become unsuitable for being presplit.

The holes shall be charged with explosives of the size, kind, strength, and at the spacing suitable for the formations being presplit, and with stemming material which passes a 9.5 mm standard sieve and which has the qualities for proper confinement of the explosives.

The finished presplit slope shall be reasonably uniform and free of loose rock. Variance from the true plane of the excavated backslope shall not exceed 300 mm; however, localized irregularities or surface variations that do not constitute a safety hazard or an impairment to drainage courses or facilities will be permitted.

A maximum offset of 600 mm will be permitted for a construction working bench at the bottom of each lift for use in drilling the next lower presplitting pattern.

### 102.2.6 Excavation of Ditches, Gutters, etc.

All materials excavated from side ditches and gutters, channel changes, irrigation ditches, inlet and outlet ditches, toe ditches, furrow ditches, and such other ditches as may be designated on the Plans or staked by the Engineer, shall be utilized as provided in Subsection 102.2.3.

Ditches shall conform to the slope, grade, and shape of the required cross-section, with no projections of roots, stumps, rock, or similar matter. The Contractor shall maintain and keep open and free from leaves, sticks, and other debris all ditches dug by him until final acceptance of the work.

Furrow ditches shall be formed by plowing a continuous furrow along the line staked by the Engineer. Methods other than plowing may be used if acceptable to the Engineer. The ditches shall be cleaned out by hand shovel work, by ditcher, or by some other suitable



method, throwing all loose materials on the downhill side so that the bottom of the finished ditch shall be approximately 450 mm below the crest of the loose material piled on the downhill side. Hand finish will not be required, but the flow lines shall be in satisfactory shape to provide drainage without overflow.

#### 102.2.7 Excavation of Roadbed Level

Rock shall be excavated to a depth of 150 mm below subgrade within the limits of the roadbed, and the excavation backfilled with material designated on the Plans or approved by the Engineer and compacted to the required density.

When excavation methods employed by the Contractor leave undrained pockets in the rock surface, the Contractor shall at his own expense, properly drain such depressions or when permitted by the Engineer fill the depressions with approved impermeable material. Material below subgrade, other than solid rock shall be thoroughly scarified to a depth of 150 mm and the moisture content increased or reduced, as necessary, to bring the material throughout this 150 mm layer to the moisture content suitable for maximum compaction. This layer shall then be compacted in accordance with Subsection 104.3.3.

#### 102.2.8 Borrow Areas

The Contractor shall notify the Engineer sufficiently in advance of opening any borrow areas so that cross-section elevations and measurements of the ground surface after stripping may be taken, and the borrow material can be tested before being used. Sufficient time for testing the borrow material shall be allowed.

All borrow areas shall be bladed and left in such shape as to permit accurate measurements after excavation has been completed. The Contractor shall not excavate beyond the dimensions and elevations established, and no material shall be removed prior to the staking out and cross-sectioning of the site. The finished borrow areas shall be approximately true to line and grade established and specified and shall be finished, as prescribed in Clause 61, Standard Specifications for Public Works and Highways, Volume 1. When necessary to remove fencing, the fencing shall be replaced in at least as good condition as it was originally. The Contractor shall be responsible for the confinement of livestock when a portion of the fence is removed.

#### 102.2.9 Removal of Unsuitable Material

Where the Plans show the top portion of the roadbed to be selected topping, all unsuitable materials shall be excavated to the depth necessary for replacement of the selected topping to the required compacted thickness.

Where excavation to the finished graded section results in a subgrade or slopes of unsuitable soil, the Engineer may require the Contractor to remove the unsuitable material and backfill to the finished graded section with approved material. The Contractor shall conduct his operations in such a way that the Engineer can take the necessary cross-sectional measurements before the backfill is placed. 26

The excavation of muck shall be handled in a manner that will not permit the entrapment of muck within the backfill. The material used for backfilling up to the ground line or water level, whichever is higher, shall be rock or other suitable granular material selected from the roadway excavation, if available. If not available, suitable material shall be obtained from other approved sources. Unsuitable material removed shall be disposed off in designated areas shown on the Plans or approved by the Engineer.

## ITEM 104 – EMBANKMENT

### 104.1 Description

This Item shall consist of the construction of embankment in accordance with this Specification and in conformity with the lines, grades and dimensions shown on the Plans or established by the Engineer.

### 104.2 Material Requirements

Embankments shall be constructed of suitable materials, in consonance with the following definitions:

1. **Suitable Material** – Material which is acceptable in accordance with the Contract and which can be compacted in the manner specified in this Item. It can be common material or rock.

Selected Borrow, for topping – soil of such gradation that all particles will pass a sieve with 75 mm square openings and not more than 15 mass percent will pass the 0.075 mm (No. 200) sieve, as determined by AASHTO T 11. The material shall have a plasticity index of not more than 6 as determined by AASHTO T 90 and a liquid limit of not more than 30 as determined by AASHTO T 89.

2. **Unsuitable Material** – Material other than suitable materials such as:

- (a) Materials containing detrimental quantities of organic materials, such as grass, roots and sewerage.
- (b) Organic soils such as peat and muck.
- (c) Soils with liquid limit exceeding 80 and/or plasticity index exceeding 55.
- (d) Soils with a natural water content exceeding 100%.
- (e) Soils with very low natural density, 800 kg/m<sup>3</sup> or lower.
- (f) Soils that cannot be properly compacted as determined by the Engineer.

### 104.3 Construction Requirements

#### 104.3.1 General

Prior to construction of embankment, all necessary clearing and grubbing in that area shall have been performed in conformity with Item 100, Clearing and Grubbing. Embankment construction shall consist of constructing roadway embankments, including preparation of the areas upon which they are to be placed; the construction of dikes within or adjacent to the roadway; the placing and compacting of approved material within roadway areas where unsuitable material has been removed; and the placing and

compacting of embankment material in holes, pits, and other depressions within the roadway area.

Embankments and backfills shall contain no muck, peat, sod, roots or other deleterious matter. Rocks, broken concrete or other solid, bulky materials shall not be placed in embankment areas where piling is to be placed or driven.

Where shown on the Plans or directed by the Engineer, the surface of the existing ground shall be compacted to a depth of 150 mm and to the specified requirements of this Item.

Where provided on the Plans and Bill of Quantities the top portions of the roadbed in both cuts and embankments, as indicated, shall consist of selected borrow for topping from excavations.

#### 104.3.2 Methods of Construction

Where there is evidence of discrepancies on the actual elevations and that shown on the Plans, a preconstruction survey referred to the datum plane used in the approved Plan shall be undertaken by the Contractor under the control of the Engineer to serve as basis for the computation of the actual volume of the embankment materials.

When embankment is to be placed and compacted on hillsides, or when new embankment is to be compacted against existing embankments, or when embankment is built one-half width at a time, the existing slopes that are steeper than 3:1 when measured at right angles to the roadway shall be continuously benched over those areas as the work is brought up in layers. Benching will be subject to the Engineer's approval and shall be of sufficient width to permit operation of placement and compaction equipment. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cuts. Material thus excavated shall be placed and compacted along with the embankment material in accordance with the procedure described in this Section. Unless shown otherwise on the Plans or special Provisions, where an embankment of less than 1.2 m below subgrade is to be made, all sod and vegetable matter shall be removed from the surface upon which the embankment is to be placed, and the cleared surfaced shall be completely broken up by plowing, scarifying, or steeping to a minimum depth of 150 mm except as provided in Subsection 102.2.2. This area shall then be compacted as provided in Subsection 104.3.3. Sod not required to be removed shall be thoroughly disc harrowed or scarified before construction of embankment. Wherever a compacted road surface containing granular materials lies within 900 mm of the subgrade, such old road surface shall be scarified to a depth of at least 150 mm whenever directed by the Engineer. This scarified materials shall then be compacted as provided in Subsection 104.3.3. When shoulder excavation is specified, the roadway shoulders shall be excavated to the depth and width shown on the Plans. The shoulder material shall be removed without disturbing the adjacent existing base course material, and all excess excavated materials shall be disposed off as provided in Subsection 102.2.3. If necessary, the areas shall be compacted before being backfilled.

Roadway embankment of earth material shall be placed in horizontal layers not exceeding 200 mm, loose measurement, and shall be compacted as specified before the next layer is placed. However, thicker layer maybe placed if vibratory roller with high

compactive effort is used provided that density requirement is attained and as approved by the Engineer. Trial section to this effect must be conducted and approved by the Engineer. Effective spreading equipment shall be used on each lift to obtain uniform thickness as determined in the trial section prior to compaction. As the compaction of each layer progresses, continuous leveling and manipulating will be required to assure uniform density. Water shall be added or removed, if necessary, in order to obtain the required density. Removal of water shall be accomplished through aeration by plowing, blading, discing, or other methods satisfactory to the Engineer.

Where embankment is to be constructed across low swampy ground that will not support the mass of trucks or other hauling equipment, the lower part of the fill may be constructed by dumping successive loads in a uniformly distributed layer of a thickness not greater than necessary to support the hauling equipment while placing subsequent layers. When excavated material contains more than 25 mass percent of rock larger than 150 mm in greatest diameter and cannot be placed in layers of the thickness prescribed without crushing, pulverizing or further breaking down the pieces resulting from excavation methods, such materials may be placed on the embankment in layers not exceeding in thickness the approximate average size of the larger rocks, but not greater than 600 mm. Even though the thickness of layers is limited as provided above, the placing of individual rocks and boulders greater than 600 mm in diameter will be permitted provided that when placed, they do not exceed 1200 mm in height and provided they are carefully distributed, with the interstices filled with finer material to form a dense and compact mass.

Each layer shall be leveled and smoothed with suitable leveling equipment and by distribution of spalls and finer fragments of earth. Lifts of material containing more than 25 mass percent of rock larger than 150 mm in greatest dimensions shall not be constructed above an elevation 300 mm below the finished subgrade. The balance of the embankment shall be composed of suitable material smoothed and placed in layers not exceeding 200 mm in loose thickness and compacted as specified for embankments.

Dumping and rolling areas shall be kept separate, and no lift shall be covered by another until compaction complies with the requirements of Subsection 104.3.3.

Hauling and leveling equipment shall be so routed and distributed over each layer of the fill in such a manner as to make use of compaction effort afforded thereby and to minimize rutting and uneven compaction.

#### 104.3.3 Compaction Compaction Trials

Before commencing the formation of embankments, the Contractor shall submit in writing to the Engineer for approval his proposals for the compaction of each type of fill material to be used in the works. The proposals shall include the relationship between the types of compaction equipment, the number of passes required and the method of adjusting moisture content. The Contractor shall carry out full scale compaction trials on areas not less than 10 m wide and 50 m long as required by the Engineer and using his proposed procedures or such amendments thereto as may be found necessary to satisfy the Engineer that all the specified requirements regarding compaction can be consistently achieved.

Compaction trials with the main types of fill material to be used in the works shall be completed before work with the corresponding materials will be allowed to commence. Throughout the periods when compaction of earthwork is in progress, the Contractor shall adhere to the compaction procedures found from compaction trials for each type of material being compacted, each type of compaction equipment employed and each degree of compaction specified.

#### Earth

The Contractor shall compact the material placed in all embankment layers and the material scarified to the designated depth below subgrade in cut sections, until a uniform density of not less than 95 mass percent of the maximum dry density determined by AASHTO T 99 Method C, is attained, at a moisture content determined by Engineer to be suitable for such density. Acceptance of compaction may be based on adherence to an approved roller pattern developed as set forth in Item 106, Compaction Equipment and Density Control Strips.

The Engineer shall during progress of the Work, make density tests of compacted material in accordance with AASHTO T 191, T 205, or other approved field density tests, including the use of properly calibrated nuclear testing devices. A correction for coarse particles may be made in accordance with AASHTO T 224. If, by such tests, the Engineer determines that the specified density and moisture conditions have not been attained, the Contractor shall perform additional work as may be necessary to attain the specified conditions.

At least one group of three in-situ density tests shall be carried out for each 500 m<sup>2</sup> of each layer of compacted fill.

#### Rock

Density requirements will not apply to portions of embankments constructed of materials which cannot be tested in accordance with approved methods.

Embankment materials classified as rock shall be deposited, spread and leveled the full width of the fill with sufficient earth or other fine material so deposited to fill the interstices to produce a dense compact embankment. In addition, one of the rollers, vibrators, or compactors meeting the requirements set forth in Subsection 106.2.1, Compaction Equipment, shall compact the embankment full width with a minimum of three complete passes for each layer of embankment.

#### 104.3.4 Protection of Roadbed During Construction

During the construction of the roadway, the roadbed shall be maintained in such condition that it will be well drained at all times. Side ditches or gutters emptying from cuts to embankments or otherwise shall be so constructed as to avoid damage to embankments by erosion.

#### 104.3.5 Protection of Structure

If embankment can be deposited on one side only of abutments, wing walls, piers or culvert headwalls, care shall be taken that the area immediately adjacent to the structure is not compacted to the extent that it will cause overturning of, or excessive pressure against the structure. When noted on the Plans, the fill adjacent to the end bent of a bridge shall not be placed higher than the bottom of the backfill of the bent until the superstructure is in place. When embankment is to be placed on both sides of a concrete wall or box type structure, operations shall be so conducted that the embankment is always at approximately the same elevation on both sides of the structure.

#### 104.3.6 Rounding and Warping Slopes

**Rounding**-Except in solid rock, the tops and bottoms of all slopes, including the slopes of drainage ditches, shall be rounded as indicated on the Plans. A layer of earth overlaying rock shall be rounded above the rock as done in earth slopes.

**Warping**-adjustments in slopes shall be made to avoid injury in standing trees or marring of weathered rock, or to harmonize with existing landscape features, and the transition to such adjusted slopes shall be gradual. At intersections of cuts and fills, slopes shall be adjusted and warped to flow into each other or into the natural ground surfaces without noticeable break.

#### 104.3.7 Finishing Roadbed and Slopes

After the roadbed has been substantially completed, the full width shall be conditioned by removing any soft or other unstable material that will not compact properly or serve the intended purpose. The resulting areas and all other low sections, holes or depressions shall be brought to grade with suitable selected material. Scarifying, blading, dragging, rolling, or other methods of work shall be performed or used as necessary to provide a thoroughly compacted roadbed shaped to the grades and cross-sections shown on the Plans or as staked by the Engineer.

All earth slopes shall be left with roughened surfaces but shall be reasonably uniform, without any noticeable break, and in reasonably close conformity with the Plans or other surfaces indicated on the Plans or as staked by the Engineer, with no variations therefrom readily discernible as viewed from the road.

#### 104.3.8 Serrated Slopes

Cut slopes in rippable material (soft rock) having slope ratios between 0.75:1 and 2:1 shall be constructed so that the final slope line shall consist of a series of small horizontal steps. The step rise and tread dimensions shall be shown on the Plans. No scaling shall be performed on the stepped slopes except for removal of large rocks which will obviously be a safety hazard if they fall into the ditchline or roadway.

#### 104.3.9 Earth Berms

When called for in the Contract, permanent earth berms shall be constructed of well graded materials with no rocks having a diameter greater than 0.25 the height of the berm. When local material is not acceptable, acceptable material shall be imported, as directed by the Engineer.

##### Compacted Berm

Compacted berm construction shall consist of moistening or drying and placing material as necessary in locations shown on the drawings or as established by the Engineer. Material shall contain no frozen material, roots, sod, or other deleterious materials. Contractor shall take precaution to prevent material from escaping over the embankment slope. Shoulder surface beneath berm will be roughened to provide a bond between the berm and shoulder when completed. The Contractor shall compact the material placed until at least 90 mass percent of the maximum density is obtained as determined by AASHTO T 99, Method C. The cross-section of the finished compacted berm shall reasonably conform to the typical cross-section as shown on the Plans.

##### Uncompacted Berm

Uncompacted berm construction shall consist of drying, if necessary and placing material in locations shown on the Plans or as established by the Engineer. Material shall contain no frozen material, roots, sod or other deleterious materials. Contractor shall take precautions to prevent material from escaping over the embankment slope.

## IV. SUBBASE AND BASE COURSES

### ITEM 200 – AGGREGATE SUBBASE COURSE

#### 200.1 Description

This Item shall consist of furnishing, placing and compacting an aggregate subbase course on a prepared subgrade in accordance with this Specification and the lines, grades and cross-sections shown on the Plans, or as directed by the Engineer.

#### 200.2 Material Requirements

Aggregate for subbase shall consist of hard, durable particles or fragments of crushed stone, crushed slag, or crushed or natural gravel and filler of natural or crushed sand or other finely divided mineral matter. The composite material shall be free from vegetable matter and lumps or balls of clay, and shall be of such nature that it can be compacted readily to form a firm, stable subbase.

The subbase material shall conform to Table 200.1, Grading Requirements

Table 200.1 – Grading Requirements

Sieve Designation		Mass Percent Passing
Standard, mm	Alternate US Standard	
50	2"	100
25	1"	55-85
9.5	3/8"	40-75
0.075	No. 200	0-12

The fraction passing the 0.075 mm (No. 200) sieve shall not be greater than 0.66 (two thirds) of the fraction passing the 0.425 mm (No. 40) sieve.

The fraction passing the 0.425 mm (No. 40) sieve shall have a liquid limit not greater than 35 and plasticity index not greater than 12 as determined by AASHTO T 89 and T 90, respectively.

The coarse portion, retained on a 2.00 mm (No. 10) sieve, shall have a mass percent of wear not exceeding 50 by the Los Angeles Abrasion Tests as determined by AASHTO T 96.

The material shall have a soaked CBR value of not less than 30% as determined by AASHTO T 193. The CBR value shall be obtained at the maximum dry density and determined by AASHTO T 180, Method D.

### 200.3 Construction Requirements

#### 200.3.1 Preparation of Existing Surface

The existing surface shall be graded and finished as provided under Item 105, Subgrade Preparation, before placing the subbase material.

#### 200.3.2 Placing

The aggregate subbase material shall be placed at a uniform mixture on a prepared subgrade in a quantity which will provide the required compacted thickness. When more than one layer is required, each layer shall be shaped and compacted before the succeeding layer is placed.

The placing of material shall begin at the point designated by the Engineer. Placing shall be from vehicles especially equipped to distribute the material in a continuous uniform layer or windrow. The layer or windrow shall be of such size that when spread and compacted, the finished layer shall be in reasonably close conformity to the nominal thickness shown on the Plans.

When hauling is done over previously placed material, hauling equipment shall be dispersed uniformly over the entire surface of the previously constructed layer, to minimize rutting or uneven compaction.



### 200.3.3 Spreading and Compacting

When uniformly mixed, the mixture shall be spread to the plan thickness, for compaction.

Where the required thickness is 150 mm or less, the material may be spread and compacted in one layer. Where the required thickness is more than 150 mm, the aggregate subbase shall be spread and compacted in two or more layers of approximately equal thickness, and the maximum compacted thickness of any layer shall not exceed 150 mm. All subsequent layers shall be spread and compacted in a similar manner.

The moisture content of subbase material shall, if necessary, be adjusted prior to compaction by watering with approved sprinklers mounted on trucks or by drying out, as required in order to obtain the required compaction.

Immediately following final spreading and smoothing, each layer shall be compacted to the full width by means of approved compaction equipment. Rolling shall progress gradually from the sides to the center, parallel to the centerline of the road and shall continue until the whole surface has been rolled. Any irregularities or depressions that develop shall be corrected by loosening the material at these places and adding or removing material until surface is smooth and uniform. Along curbs, headers and walls, and at all places not accessible to the roller, the subbase material shall be compacted thoroughly with approved tampers or compactors.

If the layer of subbase material, or part thereof, does not conform to the required finish, the Contractor shall, at his own expense, make the necessary corrections.

Compaction of each layer shall continue until a field density of at least 100 percent of the maximum dry density determined in accordance with AASHTO T 180, Method D has been achieved. In-place density determination shall be made in accordance with AASHTO T 191.

### 200.3.4 Trial Sections

Before subbase construction is started, the Contractor shall spread and compact trial sections as directed by the Engineer. The purpose of the trial sections is to check the suitability of the materials, the efficiency of the equipment and the construction method which is proposed to be used by the Contractor. Therefore, the Contractor must use the same material, equipment and procedures that he proposes to use for the main work. One trial section of about 500 m<sup>2</sup> shall be made for every type of material and/or construction equipment/procedure proposed for use.

After final compaction of each trial section, the Contractor shall carry out such field density tests and other tests required as directed by the Engineer.

If a trial section shows that the proposed materials, equipment or procedures in the Engineer's opinion are not suitable for subbase, the material shall be removed at the Contractor's expense, and a new trial section shall be constructed.

If the basic conditions regarding the type of material or procedure change during the execution of the work, new trial sections shall be constructed.

#### 200.3.5 Tolerances

Aggregate subbase shall be spread with equipment that will provide a uniform layer which when compacted will conform to the designed level and transverse slopes as shown on the Plans. The allowable tolerances shall be as specified hereunder:

Permitted variation from design THICKNESS OF LAYER	± 20 mm
Permitted variation from design LEVEL OF SURFACE	+10mm -20mm
Permitted SURFACE IRREGULARITY Measured by 3-m straight-edge	20mm
Permitted variation from design CROSSFALL OR CAMBER	±0.3%
Permitted variation from design LONGITUDINAL GRADE over 25 m in length	±0.1%

### V. SURFACE COURSES

#### ITEM 311 – PORTLAND CEMENT CONCRETE PAVEMENT

##### 311.1 Description

This Item shall consist of pavement of Portland Cement Concrete, with or without reinforcement, constructed on the prepared base in accordance with this Specification and in conformity with lines, grades, thickness and typical cross-section shown on the Plans.

##### 311.2 Material Requirements

###### 311.2.1 Portland Cement

It shall conform to the applicable requirements of Item 700, Hydraulic Cement. Only Type I Portland Cement shall be used unless otherwise provided for in the Special Provisions. Different brands or the same brands from different mills shall not be mixed nor shall they be used alternately unless the mix is approved by the Engineer. However, the use of Portland Pozzolan Cement Type IP meeting the requirements of AASHTO M 240/ASTM C 595, Specifications for Blended Hydraulic Cement shall be allowed, provided that trial mixes shall be done and that the mixes meet the concrete strength requirements, the AASHTO/ASTM provisions pertinent to the use of Portland Pozzolan Type IP shall be adopted.

Cement which for any reason, has become partially set or which contains lumps of caked cement shall be rejected. Cement salvaged from discarded or used bags shall not be used.

Samples of Cement shall be obtained in accordance with AASHTO T 127.

### 311.2.2 Fine Aggregate

It shall consist of natural sand, stone screenings or other inert materials with similar characteristics, or combinations thereof, having hard, strong and durable particles. Fine aggregate from different sources of supply shall not be mixed or stored in the same pile nor used alternately in the same class of concrete without the approval of the Engineer. It shall not contain more than three (3) mass percent of material passing the 0.075 mm (No. 200 sieve) by washing nor more than one (1) mass percent each of clay lumps or shale. The use of beach sand will not be allowed without the approval of the Engineer. If the fine aggregate is subjected to five (5) cycles of the sodium sulfate soundness test, the weighted loss shall not exceed 10 mass percent.

The fine aggregate shall be free from injurious amounts of organic impurities. If subjected to the colorimatic test for organic impurities and a color darker than the standard is produced, it shall be rejected. However, when tested for the effect of organic impurities on strength of mortar by AASHTO T 71, the fine aggregate may be used if the relative strength at 7 and 28 days is not less than 95 percent. The fine aggregate shall be well-graded from coarse to fine and shall conform to Table 311.1

Table 311.1 – Grading Requirements for Fine Aggregate

Sieve Designation	Mass Percent Passing
9.5 mm (3/8 in)	100
4.75 mm (No. 4)	95 – 100
2.36 mm (No. 8)	-
1.18 mm (No. 16)	45 – 80
0.600 mm (No. 30)	-
0.300 mm (No. 50)	5 – 30
0.150 mm (No. 100)	0 – 10

### 311.2.3 Coarse Aggregate

It shall consist of crushed stone, gravel, blast furnace slag, or other approved inert materials (coralline or dolomites) of similar characteristics, or combinations thereof, having hard, strong, durable pieces and free from any adherent coatings.

It shall consist of crushed stone, gravel, blast furnace slag, or other approved inert materials of similar characteristics, or combinations thereof, having hard, strong, durable pieces and free from any adherent coatings.

It shall contain not more than one (1) mass percent of material passing the 0.075 mm (No. 200) sieve, not more than 0.25 mass percent of clay lumps, nor more than 3.5 mass percent of soft fragments.

If the coarse aggregate is subjected to five (5) cycles of the sodium sulfate soundness test, the weighted loss shall not exceed 12 mass percent.

It shall have a mass percent of wear not exceeding 40 when tested by AASHTO T 96.

If the slag is used, its density shall not be less than 1120 kg/m<sup>3</sup>. The gradation of the coarse aggregate shall conform to Table 311.2.

Only one grading specification shall be used from any one source.

Table 311.2 – Grading Requirement for Coarse Aggregate

Sieve Designation		Mass Percent Passing		
Standard mm	Alternate U. S. Standard	Grading A	Grading B	Grading C
75.00	3 in.	100	-	-
63.00	2-1/2 in.	90-100	100	100
50.00	2 in.	-	90-100	95-100
37.5	1-1/2 in.	25-60	35-70	-
25.0	1 in.	-	0-15	35-70
19.0	3/4 in.	0-10	-	-
12.5	1/2 in.	0-5	0-5	10-30
4.75	No. 4	-	-	0-5

#### 311.2.4 Water

Water used in mixing, curing or other designated application shall be reasonably clean and free of oil, salt, acid, alkali, grass or other substances injurious to the finished product. Water will be tested in accordance with and shall meet the requirements of Item 714, Water. Water which is drinkable may be used without test. Where the source of water is shallow, the intake shall be so enclosed as to exclude silt, mud, grass or other foreign materials.

#### 311.2.5 Reinforcing Steel

It shall conform to the requirements of Item 404, Reinforcing Steel. Dowels and tie bars shall conform to the requirements of AASHTO M 31 or M 42, except that rail steel shall not be used for tie bars that are to be bent and restraightened during construction. Tie bars shall be deformed bars. Dowels shall be plain round bars. Before delivery to the site of work, one-half of the length of each dowel shall be painted with one coat of approved lead or tar paint.

The sleeves for dowel bars shall be metal of approved design to cover 50 mm, plus or minus 5 mm of the dowel, with a closed end, and with a suitable stop to hold the end of the sleeve at least 25 mm from the end of the dowel. Sleeves shall be of such design that they do not collapse during construction.

#### 311.2.6 Wire Mesh

The diameter of wire for lateral and longitudinal directions shall not be less than 6 mm in diameter. Tie wire shall be No. 16 gauged annealed wire.

##### 311.2.6.1 Fabrication of Wire Mesh

The spacing on the lateral direction is twice wider than that of the longitudinal direction. The weight of wire mesh shall not be less than 3 kg/m<sup>2</sup>. It shall be fabricated by welding or binding at each crossing point and shall meet the requirements of ASTM A 185.

##### 311.2.6.2 Installation of Wire Mesh

After placement of slip bar placed at every 9.0 m maximum interval for weakened plane joint, wire mesh shall be placed at a depth of 5.0 cm to 7.5 cm below the surface of the slab or at 2/3 of thickness from the bottom of the pavement. It shall be supported by any approved support assemblies or spacers against displacement and shall be tied to it using tie wires. The sheets of the welded wire mesh shall be flat, and proper care shall be observed in handling and placing it to ensure its installation in the proper position. Welded wire mesh that have become bent or kinked shall be rejected.

#### 311.2.7 Joint Fillers

Poured joint fillers shall be mixed asphalt and mineral or rubber filler conforming to the applicable requirements of Item 705, Joint Materials.

Preformed joint filler shall conform to the applicable requirements of Item 705. It shall be punched to admit the dowels where called for in the Plans. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint.

#### 311.2.8 Admixtures

Air-entraining admixture shall conform to the requirements of AASHTO M 154. Chemical admixtures, if specified or permitted, shall conform to the requirements of AASHTO M 194.

Fly Ash, if specified or permitted as a mineral admixture and not exceeding 20% partial replacement of Portland Cement in concrete mix shall conform to the requirements of ASTM C 618.

Admixture/s maybe added to the concrete mix to produce some desired modifications to the properties of concrete if necessary, but not as partial replacement of cement. If specified, monofilament polypropylene synthetic fibrin fibers, which are used as admixture to prevent the formation of temperature/shrinkage cracks and increase impact

resistance of concrete slabs shall be applied in the dosage rate recommended by its manufacturer.

#### 311.2.9 Curing Materials

Curing materials shall conform to the following requirements as specified;

- a) Burlap cloth - AASHTO M 182
- b) Liquid membrane forming compounds - AASHTO M 148
- c) Sheeting (film) materials - AASHTO M 171

Cotton mats and water-proof paper can be used.

#### 311.2.10 Calcium Chloride/Calcium Nitrate

It shall conform to AASHTO M 144, if specified or permitted by the Engineer, as accelerator.

#### 311.2.11 Storage of Cement and Aggregate

All cement shall be stored, immediately upon delivery at the Site, in weatherproof building which will protect the cement from dampness. The floor shall be raised from the ground. The buildings shall be placed in locations approved by the Engineer. Provisions for storage shall be ample, and the shipments of cement as received shall be separately stored in such a manner as to allow the earliest deliveries to be used first and to provide easy access for identification and inspection of each shipment. Storage buildings shall have capacity for storage of a sufficient quantity of cement to allow sampling at least twelve (12) days before the cement is to be used. Bulk cement, if used, shall be transferred to elevated air tight and weatherproof bins. Stored cement shall meet the test requirements at any time after storage when retest is ordered by the Engineer. At the time of use, all cement shall be free-flowing and free of lumps.

The handling and storing of concrete aggregates shall be such as to prevent segregation or the inclusion of foreign materials. The Engineer may require that aggregates be stored on separate platforms at satisfactory locations.

In order to secure greater uniformity of concrete mix, the Engineer may require that the coarse aggregate be separated into two or more sizes. Different sizes of aggregate shall be stored in separate bins or in separate stockpiles sufficiently removed from each other to prevent the material at the edges of the piles from becoming intermixed.

#### 311.2.12 Proportioning, Consistency and Strength of Concrete

The Contractor shall prepare the design mix based on the absolute volume method as outlined in the American Concrete Institute (ACI) Standard 211.1, "Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete".

It is the intent of this Specification to require at least 364 kg of cement per cubic meter of concrete to meet the minimum strength requirements. The Engineer shall determine from laboratory tests of the materials to be used, the cement content and the proportions of aggregate and water that will produce workable concrete having a slump of

between 40 and 75 mm if not vibrated or between 10 and 40 mm if vibrated, and a flexural strength of not less than 3.8 MPa when tested by the third-point method or 4.5 MPa when tested by the mid-point method at fourteen (14) days in accordance with AASHTO T 97 and T 177, respectively; or a compressive strength of 24.1 MPa for cores taken at fourteen (14) days and tested in accordance with AASHTO T 24.

Slump shall be determined using AASHTO T 119.

The designer shall consider the use of lean concrete (econocrete) mixtures using local materials or specifically modified conventional concrete mixes in base course and in the lower course composite, monolithic concrete pavements using a minimum of 75 mm of conventional concrete as the surface course.

The mix design shall be submitted to the Engineer for approval and shall be accompanied with certified test data from an approved laboratory demonstrating the adequacy of the mix design. A change in the source of materials during the progress of work may necessitate a new design mix.


Prepared By:

  
**JUBILE D. ALARCON**  
Civil - Estimator

Checked by:

  
**Engr. NOELF. YAMBAC**  
Officer-in-Charge, PMD

Noted:

  
**Engr. JEOFFREY L. MACALALAD**  
Officer-in-Charge, PEPD