A. GENERAL REQUIREMENTS

SECTION 01
SUMMARY OF WORKS

PART 1 GENERAL REQUIREMENTS

All works incidental to the completion of the above-mentioned major of work items shall be part of the scope of work. During the execution of the work, the Project-In-Charge shall see to it that port operations shall not be affected, and the site must be free of dirt and debris at all times.

PART 2 SCOPE

The work includes the furnishings of all materials, labor tools and equipment and the performance of all operations necessary for the construction and completion of the project: **REPAIR OF DAMAGED PPCP AT PORTION OF AREA G, 2ND AVENUE AND 2ND STREET INCLUDING DRAINAGE LINE AND CONCRETING OF PAVEMENT AT PORTION OF BACK-UP AREA AT AREA Q, PORT OF CAGAYAN DE ORO**, including all appurtenances necessary to complete the work and as known on the drawing.

PART 3 LOCATION

The proposed work is located at the Port of Cagayan de Oro City.

SECTION 02
CONTRACT DOCUMENTS

PART 1 GENERAL

The Contractor shall use the English Language and the Modern metric system of weights and measurements in all documents, drawings and corresponding related to the Contract.

PART 2 DEFINITIONS

The following terms used in the Contract Documents shall be interpreted as follows:

2.1 OWNER: **PHILIPPINE PORTS AUTHORITY, PMO-MISAMIS ORIENTAL/CDO**
2.2 COMMITTEE is the **PMO-MOC BIDS AND AWARDS COMMITTEE**

PART 3 CHANGE ORDERS

With a written request, the Owner may at anytime issue revisions to the Contract Documents and drawings or additional drawings.

PART 4 RECORDS

The Contractor shall keep all documents, books and other records concerning the contract with the work for a period of five (5) years reckoned from receipt of final payment.

SECTION 03
SITE REQUIREMENTS

1.1 LOCATION AND BOUNDARIES OF SITE

A. The contractor during the performance of this contract will be restricted to the use of the work site, haul roads and assigned housing and messing storage and laydown areas assigned by the OWNER. The contractor shall comply with the national standards, conditions and minimum health protocols for construction and use of site offices work site and laydown areas.

B. The location of those parts of the site allocated for the permanent works together with all boundaries are shown on the site plan included with the contract drawings. The contractor is advised to ascertain this area during his site visit and he shall take such measures given within these conditions and exercise such care as to protect this area and boundaries during the course of the works and as may be directed by the Engineer.

C. The contractor shall install and/or put in place barricades, or temporary fencing to enclose the work areas as shown on the site plan and all other areas allocated by the Engineer. The contractor shall not allow his workmen or any other person to pass beyond the limits of the site other than the purpose of access.

1.2 ACCESS TO SITE

A. Within the OWNER's area, the OWNER shall designate the access and egress routes for the contractor's use. The contractor shall be entirely responsible for the provision of any sign or direction on any such route that he may consider necessary for the guidance of his staff, workmen and visitor, for obtaining permission that may be required from any authority for the use of such or the provisions of such signs or directive.

1.3 SITE WORKING SPACE

A. The contractor shall take note of the area for building operations available within the site area and shall confine his apparatus storage lots of materials, and operations of his workforce within those confines and to the direction of the Engineer and shall not unreasonably encumber the site with untidy material.

1.4 STAGING AREAS

A. The contractor will not be allocated staging areas outside the site boundaries.

SECTION 04
PROJECT HEALTH AND SAFETY

1.1 CONTRACTOR'S RESPONSIBILITY FOR SAFETY

The Contractor shall be solely and entirely responsible for the safety of all people entering and/or working on the site and for all members of the general public affected in any way by the activities of the Contractor in connection with the execution of the works on the site, including the delivery and removal of construction equipment, materials and goods to and from the site.

The Contractor shall also be held solely and entirely responsible for the adequate protection of the whole of the Works at all times (including safe storage of materials and goods not yet incorporated into the Works and partially completed work) until the issuance of the Certificate of Completion for the Works.

The Contractor shall comply with all the laws, regulations and the like of any Authority having jurisdiction over the Site, including those relating to safety of persons and road users, etc., and shall maintain the Site in a safe condition.

To ensure the safety not only of his own personnel but also those of the OWNER, the Engineer and all others with legitimate reason to be on the Site, The Contractor shall at all times maintain the Site in a clean, tidy and organized fashion. The Contractor shall ensure that his supervisory personnel fully understand the need for such a policy and shall make them responsible for its proper implementation.

The Contractor shall also assume full responsibility for the adequacy, stability and safety of all On-Site operations and methods of construction, including all Temporary Works.

1.2 CONTRACTOR'S CONSTRUCTION SAFETY AND HEALTH PLAN

Before construction work commences, the Contractor shall prepare a Construction Safety and Health Plan detailing all the necessary rules, regulations and procedures to be implemented on the Site in respect of health and safety aspects and emergency procedures, a copy of which must be deposited with the Engineer for his review and approval. The Construction Safety and Health Plan shall incorporate a Safety Statement signed by the Project Manager, setting out the Contractor's policy in regard to safety in the workplace.

The construction safety and Health plan shall be in accordance with the requirements of Department Order No. 13 "Guidance Governing Occupational Safety and Health in the Construction Industry" of the Department of Labor and Employment and "Construction Guidelines for Project Implementation during the period of the Public Health Emergency" issued by the Philippine Domestic Construction Board (PDCB) and the Construction Industry Authority of the Philippines (CIAP).

1.3 CONTRACTOR'S SITE SAFETY OFFICER

The Contractor shall engage a full time Site Safety Officer to be based on the site, whose specific duty will be to consider and deal with all safety matters and who shall be present on the site from the outset of the Contractor's on-site activities. The site safety officer shall have proven experience in site safety plan implementation and be fully conversant with safety requirements relating to construction site in general and with Contractor's Construction Safety and Health Plan for the works in particular.

The contractor's representative, assisted by the site safety officer, shall be responsible for ensuring that the Construction Safety and Health Plan is fully and effectively implemented throughout all areas of the site. As part of the campaign to ensure an accident-free working environment on the Site, and to better the understanding of all issues involved, the site safety officer shall arrange for safety seminars to be held for all workers before they commence working on the site.

1.4 PROTECTION MEASURE FOR WORKERS AND THE PUBLIC

The contractor shall ensure that the methodology of all work activities is thoroughly thought out beforehand, with special consideration being given to safety precautions at hazardous work areas, not only to protect the workers but also all others who may be affected by such activities. Wherever work is such that workers or passers-by may be in danger, the Contractor shall ensure that all necessary walkways, overhead protection, barriers, guard rails and the like are properly in place

before such work begins, and that adequate signs are erected to notify people of the danger of deviating from the designated walk area.

The sequence and timing of construction operations shall be in full accordance with good, safe construction practice.

1.1 AVAILABILITY OF FIRE FIGHTING EQUIPMENT, FIRST AID FACILITIES AND EMERGENCY SERVICES

The Contractor shall draw up appropriate emergency escape procedures for and designate appropriate escape roues from all structures and construction work areas on the Site, to ensure that all personnel can be evacuated quickly and safely in the event of an emergency occurring.

The Contractor shall provide and maintain fire extinguishers, fully charged and other facilities necessary for reasonable fire protection throughout the site. The Contractor shall also provide and maintain, at easily accessible locations throughout the site adequate first aid kits at least to the standard as may be required by current legislation or subsequent amendments thereto, together with reasonable quantities of bandages, sterile materials and other supplies for first-aid treatment of minor injuries.

The Contractor shall determine the location of the nearest available hospital (or other appropriate medical services), fire station and police station, and shall maintain an updated list of such information posted at strategic locations throughout the site.

1.2 CONSTRUCTION GUIDELINES FOR PROJECT IMPLEMENTATION DURING THE PERIOD OF PUBLIC HEALTH EMERGENCY

The Contractor shall abide to PPA Engineering Circular No. 01-2020 dated 15 May 2020 and the Philippine Domestic Construction Board (PDCB) on the Construction Safety Guidelines for Project Implementation During the Period of Public Health Emergency.

The Contractor is directed to implement the following:

A. Only persons from Twenty-One (21) to Fifty-Nine (59) years of age, without pre- **existing health conditions, such as, but not limited to Immunodeficiency, comorbidities or other health risk and who did not come in contact with someone with COVID-19 shall be allowed to be included in the workforce.**

B. The Contractor shall provide for their personnel/workers the necessary welfare faculties and amenities.

C. Compliance to social distancing, proper hygiene and mandatory wearing of face masks and other protective personnel equipment shall be ensured for all on-going projects as precautionary measures to avoid and contain the spread of COVID-19 in the work place.

D. Field Offices, employees' quarters, bunkhouses and other common areas shall be maintained to ensure cleanliness and daily disinfection of said areas must be conducted accordingly.

E. Contractors shall provide disinfection facilities such as handwashing station, footbath and others to be placed at various locations.

F. Contractors shall ensure that their project is in compliance to DOLE DO No. 13 Series of 1998. Personnel and workers shall be provided with he supply of vitamins particularly Vitamin C and other over the counter medicines quarantine facilities and oxygen tanks for emergency purposes.

G. Safety Officer of the Contractor shall regularly conduct briefing on the information regarding COVID-19 construction protocols on top of other safety requirements.

H. As preventive measure, daily monitoring of the pre and post work health conditions of workers shall be undertaken by the Contractor's Health/safety officer particularly the temperature, blood pressure and exposure monitoring. Personnel with symptoms relative to COVID-19 shall be immediately isolated and quarantined for fourteen (14) days and if necessary, brought to the DOH COVID-19 treatment facility under strict confidentiality/privacy.

I. Daily health monitoring report shall be prepared by the Safety Officer and to be submitted to the assigned PPA Project Engineer.

J. Proper protocols in accordance with the DTI and DOLE Interim Guidelines and the Local Government Unit Policy on work place prevention and control of COVID-19 shall likewise be strictly observed.

K. Daily work activities shall be under strict monitoring by the Safety Officer to ensure compliance with safety standards and quarantine protocols.

L. Sharing of construction and office equipment is discouraged. However, if it cannot be avoided, disinfection of equipment in between transfer shall be conducted.

M. All materials and equipment brought inside the project site shall be disinfected as much as possible.

N. Non-essential personnel, visitors and general public shall be restricted to enter the project site. Al personnel entering the construction site premises on a temporary basis shall be properly logged and checked for symptoms. Gatherings, liquors, and/or merry-making are strictly prohibited in the project site.

O. Clustered and staggered deployment of employees within the construction site shall be observed to minimize personnel contact.

P. The Contractor shall submit to the OWNER the inventory of work activities including the proposed sequencing of activities to be followed and undertaken to comply to the required social distancing. Break times shall be conducted in a staggered manner.

SECTION 05
QUALITY CONTROL

1.1 DEFINITION

Specific quality control requirements for the WORK are indicated throughout the Contract Documents. The requirements of this sections are primarily related to performance of the Work beyond furnishing of manufactured products. The term "Quality Control" includes inspection, sampling and testing, and associated requirements.

1.2 SAMPLING AND TESTING

A. Unless otherwise indicated, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM and AASHTP as applicable to the class and nature of the article or material considered; however, the OWNER reserves the right to use any generally-accepted system of sampling and testing which, in the opinion of the PPA Project Engineer will ensure the OWNER that the quality of Work is in full accord with the Contract Documents.

B. Any waiver by the OWNER of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee or substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial Work, shall not be construed as a waiver of any requirements of the Contract Documents.

C. Notwithstanding the existence of such waiver, the PPA Project Engineer reserves the right to make independent investigations and test, and failure of any portion of the Work to meet any of the requirements of the Contract Documents, shall be reasonable cause for the PPA Project Engineer to require the removal or correction and reconstruction of any such Work in accordance with the General Conditions.

B. SITEWORKS

SECTION 01
DEMOLITION AND REMOVAL WORKS

1.1 SCOPE OF WORK

A. The work includes the furnishing of all labor, materials and equipment required to carry out the demolition and removal of existing dilapidated pavements, as required for the execution of the contract.

B. The Contractor shall submit the proposed methodology or procedure of demolition work with detailed drawings and calculations if necessary, to the Engineer for approval, before the execution of the Works.

C. The Contractor shall keep all pavements and landing areas to and from the site of the disposal area clean and free of mud, dirt and debris during and after the execution of disposal. Disposal of debris and materials shall be as directed by the Engineer.

1.2 GENERAL PROVISIONS

A.	The Contractor shall be deemed to have satisfied himself of the site conditions, and to have included in his unit prices provision for all risks that may arise during or in connection with the work.
B.	The demolition work shall be carried out by approved methods and equipment such as concrete breakers, gas-cutters, hydraulic jacks, compressed air disintegrators, etc., however, no blasting shall be used unless approved in writing by the Engineer and after obtaining the written permission of the concerned Authorities.
C.	The Contractor shall provide suitable equipment, skilled labor and appropriate temporary works such as scaffoldings to ensure safety in his demolition works as well as in the adjacent area.

1.3 INTERFERENCE WITH PORT OPERATIONS

A.	During the execution of the work, the Contractor shall not interfere with the shipping, navigation and other traffic in the port.
B.	The Contractor shall make arrangements with the operations people on the schedule of demolition and related works to keep port operation activities undisturbed at all times.
C.	Prior to commencement of the demolition works, the Contractor shall inform/announce to port users the schedule of disconnection of utilities.

1.4 STORAGE AND DUMPING

A.	The Contractor shall separate materials to be salvaged from debris. Salvaged materials shall be loaded, transported and unloaded by the Contractor at the specified locations.
B.	The Contractor may dump debris on land areas but out of the site, which areas shall be procured and prepared at his own expense. In this case, safety measures shall be undertaken in the transporting, unloading, covering and others as requested by the Engineer..

1.5 EXECUTION

A.	Demolish buildings, pavements, curbs, fences, utilities, services, navigation aids and the like as determined in the field for each project and as shown on the drawings or as directed by the Engineer.
B.	Materials coming from the demolish works shall be properly disposed by the Contractor.

1.6 SAFETY

A.	At the end of each day's work, the site shall be left in safe condition, so that no part is in danger of toppling, or falling or creating hazards to personnel or equipment.

1.7 MEASUREMENT AND PAYMENT

A.	Demolition and removal, unless otherwise noted, shall be measured by number or unit quantities or lump sums as appropriate for each class of work for each category. Cost of disposal of debris shall be incidental to the work and shall not be paid for separately.
B.	Demolition and removal of existing pavement shall be measured and paid for under this section unless such pavement falls within or above the new subgrade, in which case, measurement and payment shall be under Division 5, "Roads and Pavements."
C.	The price listed above shall be full compensation for all labor, materials, tools and equipment and all incidental works necessary for the successful completion of work.

B. ROADS AND PAVEMENT

SECTION 02
SURVEY AND LAY- OUT

1.1 GENERAL

A.	Division 1, "General Requirements" of these Specifications and shall apply to this Section whether herein referred to or not.

1.2 SCOPE OF WORK

A.	This Section covers survey and layout work.

1.3 SURVEY AND SETTINGOUT WORKS

A.	The Contractor shall carry out the survey by means of transversing and leveling connected to the approved established reference points.
B.	The Contractor shall establish at least three (3) permanent monuments and three (3) benchmarks in the port area on locations approved by the Engineer that can serve conveniently as reference points of future construction.

SECTION 03
DEMOLITION/BREAKING OF EXISTING PAVEMENT AND DISPOSAL OF MATERIALS

1.1 GENERAL

A.	"General Requirements" contain provisions and requirements essential to these specifications; and apply to this Section, whether or not referred to herein.

1.2 DESCRIPTION

A.	This work shall consist of the breaking of existing pavement and disposal of unsuitable or excess materials including the removal of all superficial obstructions on the site in the way of or otherwise affected by the works as shown on the drawings. The Contractor shall clear each part of the site at times and to the extent required or approved by the Engineer.
B.	The Contractor shall submit his proposed method of breaking of existing pavement and disposal of materials including materials, equipment, and all related works for the approval of the Engineer.

1.3 DEMOLITION

A.	Where shown on the drawings or directed by the Engineer, dilapidated pavement and structures, or part of structures, masonry, and like material within the roadway and sidewalk shall be demolished by the Contractor. Where only a part of a structure has to be demolished, the Contractor shall take all possible care to ensure that only such part is demolished and shall make good at his own expense any damage beyond that part. During demolition, the Contractor shall take every precaution to protect the unaffected roadway, structure, embankment and all other existing works from damage and likewise ensure the safety of his workmen and the general public.
B.	When the area on which an embankment is to be placed has been cleared, the Engineer may order the surface of the existing ground to be scarified so that the filling material will bind into the original ground. The cost of such work, if so required, shall be included in other items of

	work and shall not be paid for separately.

1.4 DISPOSAL

A.	All demolished materials shall be removed or deposited off the site in dumps to be provided by the Contractor in a manner approved by the Engineer. If however, in the opinion of the Engineer, the demolished material is suitable for filling, the Engineer will direct that the material be used. The Contractor may, with the written approval of the Engineer, use for the purposes of the works any cleared materials which are at his disposal.

1.5 MEASUREMENT AND PAYMENT

A.	Demolition/breaking of existing pavement to be paid for shall be measured by square meters of the pavement in its original position for material actually demolished and disposed.
B.	The quantities determined will be paid for at the contract unit prices for the pay items as shown in the Bill of Quantities which prices and payment shall be the full compensation for the demolition and disposal of all materials inclusive of all labor, equipment, tools and incidentals necessary to complete the items and as certified by the Engineer.

SECTION 04
EXCAVATION AND DISPOSAL OF UNSUITABLE MATERIALS

1.1 ROADWAY EXCAVATION

A.	The Contractor shall carry out all excavation required along the roadway and sidewalk regardless of the type of soil or obstructions thereat. All excavation shall be carried out to lengths, widths, depths and profiles necessary of the construction of the roads shown on the drawings or to such other dimensions as may be approved in writing by the Engineer.
B.	Excavation shall be carried out in such a way as to avoid disturbance to the surrounding ground and other existing works.
C.	Particular care shall be taken to maintain stability when excavating in close proximity to existing structures, and for underground utilities. The Contractor shall comply with all instructions of the Engineer regarding the supporting of the sides of excavation and shall be entirely responsible for the sufficiency of all temporary timbering and supports to the excavation. Any unsound formation areas or underground utility uncovered as a result of the excavation shall be reported to the Engineer immediately for his instructions.

1.2 EXCESS EXCAVATION

A.	If for any cause whatsoever excavations are carried out beyond their true line and level, other than at the direction of the Engineer, the Contractor shall at his own cost make good to the required line and level with appropriate grade of filling or by other approved material and in such manner as the Engineer may direct.

1.3 DISPOSAL OF UNSUITABLE AND EXCESS MATERIALS

A.	If in the opinion of the Engineer, the excavated material is unsuitable for backfill, the Engineer will direct that the material be removed from the site and disposed of in an approved location. All excess materials shall also be disposed of where directed by the Engineer.

1.4 MEASUREMENT AND PAYMENT

A.	The cost of excavation of material which is incorporated in the works in embankments or in

	other areas of fill shall be deemed to be included in the items relating to the parts of the work where the material is used. Measurement of unsuitable or surplus material shall be the net volume in its original position, in cubic meters.

SECTION 05
SUBGRADE PREPARATION AND COMPACTION

1.1 GENERAL

A.	"General Requirements" contain provisions and requirements essential to these specifications; and apply to this Section, whether or not referred to herein.

1.2 DESCRIPTION

A.	The subgrade preparation shall be the part of the work which is the preparation for the support of the subbase or, if there is no subbase, the surfacing of the pavement structure. It shall extend to the full width of the road including the shoulders as shown in the drawings or as specified herein. Unless otherwise agreed by the Engineer subgrade preparation of a section of road shall not commence unless the Contractor is able, after the completion and acceptance of the work, to commence immediately pavement construction.

1.3 MATERIAL REQUIREMENTS

A.	Unless otherwise stated in the Contract and except when the subgrade is in rock cut, all materials below subgrade level to a depth of 150 mm or to such greater depth as may be specified shall meet the requirements of selected borrow for topping, e.g., soil of such gradation that all particles will pass a sieve with 75 mm (3 inches) square openings and not more than 15 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 liquid limit of not more than 30 as determined by AASHTO T89.

1.4 EXECUTION

A.	Prior to commencing the preparation of the subgrade all culverts, ditches, drains and drainage outlets shall be completed. No work shall be started on the preparation of the subgrade before the prior works are herein approved by the Engineer.
B.	Where the new pavement is to be constructed immediately over an existing gravel surfaced pavement and if so specified in the Contract the pavement shall be scarified, thoroughly loosened, reshaped and recompacted in accordance with item 3 below.
C.	Unless otherwise ordered by the Engineer a variable load pneumatic tired roller shall be used to proof roll the subgrade. The roller shall have a load variable within the range of at least from 15 to 45 tons, on an overall width not greater than 3.2 m and shall have tires whose pressures are variable up to not less than 620 KN/sq.m. The wheels shall be in row and shall be capable of considerable vertical movement relative to each other without appreciable variation in loading either by each supporting a separate ballast unit, or by virtue of an efficient interconnecting suspension system. The ballast shall be in a form which permits rapid adjustment of loads. The total loaded weight and tire pressure used at any time shall be as directed by the Engineer. The pneumatic tired roller shall not be towed over completed subbases or surfacings without the prior approval of the Engineer on each occasion. The proof rolling shall consist of one pass of the roller along the center of each lane of the traveled way. The subgrade shall be compacted to a depth of 150 mm to the requirements of **Table 5.6.1**. This work shall comply with all the specified requirements for compaction of earthwork. **Table 5.6.1**

Compaction Requirements

Soil Type Classification According to AASHTO M 145	Test Method for Determining Moisture Density Relations	Minimum Relative Density Field Dry Density as % of Maximum Dry Density as Determined by the Specified Test Method
A - 1 A - 2 - 4 A - 2 - 5 A – 3	AASHTO T 180 (4.54 kg rammer) Method D	90%
A - 2 - 6 A - 2 - 7 A - 4 A - 5 A - 6 A – 7	AASHTO T 99 (4.54 kg rammer) Method D	95%

D. Protection of Completed Work

Any part of the subgrade that has been completed shall be protected and any damage resulting from default of the Contractor shall be repaired as directed by the Engineer without additional payment.

The Contractor shall be responsible for all the consequences of traffic being admitted to the subgrade. He shall repair any ruts or ridges occasioned by his own traffic or that of others by reshaping and recompacting. He shall limit the amount of subgrade preparation to an area that can be maintained with the equipment available. He shall arrange for subgrade preparation and subbase or base placing to follow each other closely. The subgrade, when prepared too soon in relation to the laying of the sub base, is liable to deteriorate, and in such case the Contractor shall, without additional payment, repair, reroll, or recompact the subgrade as may be necessary restore it to the state specified herein.

E. Tolerances

Aggregate subbase material 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 Drawings. The allowable tolerances shall be as specified hereunder:

Permitted variation from design thickness of layer	+20 mm
Permitted variation from design level of surface	+10 mm
Permitted surface irregularity measured By 3 m straightedge	20 mm
Permitted variation from design crossfall or camber	+0.3%
Permitted variation from design longitudinal grade over 25 m length	+0.1%

1.5 MEASUREMENT AND PAYMENT

A. The quantity of subgrade preparation to be paid shall be measured by the area in square meters, compacted and accepted by the Engineer.

B. Payment of subgrade preparation shall be based on the number of square meters, as provided above, which price and payment shall constitute full compensation for furnishing all materials, labor, equipment, tools and incidentals necessary to complete the item and accepted by the Engineer.

SECTION 06
AGGREGATE SUBBASE COURSE

1.1 GENERAL

A.	Division 1 "General Requirements" contain provisions and requirements essential to these Specifications; and apply to this Section, whether or not referred to herein.

1.2 DESCRIPTION

A.	This Section shall consist of compacting an aggregate subbase course on a prepared subgrade in accordance with these Specifications and the lines, grades and cross sections shown on the Drawings, or as directed by the Engineer.

1.3 MATERIAL REQUIREMENTS

A. 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 5.7.1**, Grading Requirements.

Table 5.7.1
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 an 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 25% 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.

1.4 EXECUTION

A. Preparation of Existing Surface

The existing surface shall be graded and finished as provided under Section 5.6, "Subgrade Preparation", before placing the subbase material.

B. Placing

The subbase material shall be placed as 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 be in reasonably close conformity to the nominal thickness shown on the Drawings. 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.
C.	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 material shall be spread and compacted in two or more layers of approximately equal thickness, and the maximum compacted thickness of any one 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 smoothening, 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 the 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 layers 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.
	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 and the efficiency of the equipment and 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 m2 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.
	Tolerances Aggregate subbase material 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 Drawings. The allowable tolerances shall be as specified hereunder: Permitted variation from design thickness of layer +20 mm Permitted variation from design level of surface +10 mm Permitted surface irregularity measured 20 mm

	By 3 m straightedge	
	Permitted variation from design crossfall or camber	+0.3%
	Permitted variation from design longitudinal grade over 25 m length	+0.1%

1.5 MEASUREMENT AND PAYMENT

A.	Measurement Aggregate subbase course shall be measured by the cubic meter (m3). The quantity to be paid for shall be the design volume compacted in place as shown on the Drawings, and accepted in the completed course. No allowance will be given for materials placed outside the design limits shown on the cross sections. Trial sections shall not be measured separately but shall be included in the quantity of subbase herein measured.
B.	Payment The accepted quantities measured shall be paid for at the contract unit price for aggregate subbase course which price and payment shall be full compensation for furnishings and placing all materials, including all labor, equipment, tools and incidentals necessary to complete the work prescribed in this Section.

SECTION 07
AGGREGATE BASE COURSE

1.1 GENERAL

A. DESCRIPTION

This Section shall consist of furnishing, placing and compacting aggregate base course on a prepared subgrade in accordance with this Specification and the lines, grades, thickness and typical cross sections shown on the Plans, or as established by the Engineer.

1.2 MATERIAL REQUIREMENTS

A. Aggregate for base course shall consist of hard, durable particles or fragments of 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 base.

The base course material shall conform to **Table 5.8.2.1**,

Table 5.7.2
Grading Requirements

Sieve Designation		Mass Percent Passing	
Standard (mm)	**Alternate US Standard**	**Grading A**	**Grading B**
50.0	2"	100	
37.5	1 1/2"	-	100
25.0	1"	60-85	
19.0	3/4"	-	60-85
12.5	1/2"	36-65	-
4.75	No. 4	20-50	30-55
0.425	No. 40	5-20	8-25
0.075	No. 200	0-12	2-14

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 25 and plasticity index not greater than 6 as determined by AASHTO T 89 and T 90, respectively.

1.3 EXECUTION

A. Preparation of Existing Surface

The existing surface shall be graded and finished as provided under Section 5.6, "Subgrade Preparation", before placing the base material.

B. Placing

The aggregate base material shall be placed as 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 be in reasonably close conformity to the nominal thickness shown on the Drawings.

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.

C.	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 material shall be spread and compacted in two or more layers of approximately equal thickness, and the maximum compacted thickness of any one 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 smoothening, 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 the 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 layers of subbase material, or part thereof, does not conform to the required finish, the Contractor shall, at his own expense, make the necessary corrections. The field density required of each layer is not less than 98 percent of the maximum dry density determined in accordance with AASHTO T 180 (ASTM D1557).

1.4 MEASUREMENT AND PAYMENT

A.	Measurement Aggregate subbase course shall be measured by the cubic meter (m^3). The quantity to be paid for shall be the design volume compacted in place as shown on the Drawings, and accepted in the completed course. No allowance will be given for materials placed outside the design limits shown on the cross sections. Trial sections shall not be measured separately but shall be included in the quantity of aggregate base course herein measured.
B.	Payment The accepted quantities measured shall be paid for at the contract unit price for aggregate subbase course which price and payment shall be full compensation for furnishings and placing all materials, including all labor, equipment, tools and incidentals necessary to complete the work prescribed in this Section.

SECTION 08
PORTLAND CEMENT CONCRETE PAVEMENT

1.1 GENERAL

A.	Division 1 "General Requirements" contain provisions and requirements essential to these Specifications; and apply to this Section, whether or not referred to herein.

1.2 DESCRIPTION

A.	This work shall consist of constructing pavement of Portland cement concrete on a prepared base for roads and parking area in accordance with the Specifications and the Drawings. The Contractor shall submit his proposed method of construction of cement concrete pavement including materials, equipment, and all related works for the approval of the Engineer.

1.3 MATERIAL REQUIREMENTS

A. CONCRETE

The class of concrete for the cement concrete pavement shall be Class B2, as specified in Section 3.2, "Concrete Works".

CONCRETE MATERIALS

Portland cement and fine and coarse crushed aggregates shall conform to the requirements of Section 3.2, "Concrete Works".

The aggregate shall unless otherwise ordered by the Engineer be combined in properties to produce a mixture within the grading limits for combined aggregates shown in the **Table 5.12.1**.

Table 5.12.1
Grading of Combined Aggregates

US Standard Sieve		**Percent Passing by Weight**
mm	**Alternative**	**Class C**
50.0	(2")	80-95
37.5	(1 1/2")	65-87
25.0	(1")	50-75
19.0	(3/4")	45-66
9.5	(3/8")	38-55
4.75	(No. 4)	30-45
2.36	(No. 8)	23-35
1.18	(No. 16)	17-27
0.600	(No. 30)	10-17
0.300	(No. 50)	4-9
0.150	(No. 100)	1-3
0.075	(No. 200)	0-2

STORAGE OF CEMENT AND AGGREGATES

The storage of cement and aggregates shall conform with the requirements of Section 3.2, "Concrete Work".

ADMIXTURES

Admixtures shall only be used with the written permission of the Engineer. If air entraining agents, water reducing agents, set retarders or strength accelerators are permitted to be used, they shall not be used in greater dosages than those recommended by the manufacturer, or permitted by the Engineer.

	TIE BARS AND DOWELS Tie bars for joints and dowels shall be deformed steel bars conforming to the requirements specified in AASHTO M 31. Sizes shall be as indicated on the drawings. The deformed steel bars shall be Grade 40 and shall be shipped in standard bundles, tagged and marked in accordance with the code of Standard Practice of the Concrete Reinforcement Steel Institute.
	JOINT FILLER Preformed joint filler shall conform to the requirements of AASHTO M 153 or M 213. It shall be punched to admit the dowels where called for on the drawings. The filler for each joint shall be furnished in a single piece for the depth and width required for the joint.

1.4 EXECUTION

A. PROPORTIONING, CONSISTENCY AND MIXING OF CONCRETE

The proportioning, consistency and mixing of concrete shall conform with the requirements of Section 3.2.

B. TRANSPORTING AND DELIVERY OF MIXED CONCRETE

Transporting and delivery of mixed concrete shall be in accordance with the requirements of Section 3.2.

C. PREPARATION

The base shall be watered and thoroughly moistened prior to the placing of the concrete.

D FORMWORK CONSTRUCTION

1. Formwork shall comply with the requirements of Section 3.2 under the title "Formwork" and with the requirements below.

   Forms shall be of steel, of an approved section, and shall be straight and of a depth equal to the thickness of the pavement at the edge. The base of the forms shall be of sufficient width to provide necessary stability in all directions. The flange braces must extend outward on the base not less than 2/3 the height of the form.

2. All forms shall be rigidly supported on a bed of thoroughly compacted material during the entire operation of placing and finishing the concrete. They shall be set with their faces vertical so as to produce a surface complying with the tolerance requirements in **Table 5.12.2**.

Table 5.12.2
Tolerances for Cement Concrete Pavement

Item	Tolerance
Permitted variation from design thickness of layer	+5 mm
Permitted variation from design level of surface	+5 mm
Permitted surface irregularity measured by 3 m straightedge	5 mm
Permitted variation from design crossfall orcamber	+0.2%

3. Except for the concreting of short sections, the length of formwork erected, checked and approved by the Engineer shall not be less than 150 m at the time of

	commencement of concreting on any one day. 4. Adjacent lanes may be used in lieu of forms for supporting finishing equipment provided that proper protection is afforded to the concrete of the adjacent lanes to prevent damage, and further provided that the surface of the concrete carrying the finishing equipment does not vary more than 3 mm in each 3 m length. Adjacent lanes in lieu of forms may not be used until the concrete is at least 7 days old. Flanged wheels of the finishing equipment shall not be operated on the concrete surface. The inside edge of supporting wheels of the finishing machine shall not operate closer than 100 mm from the edge of the concrete lane. 5. Alternative to placing forms, slip-forming may be used. Slip-form paving equipment shall be equipped with the travelling side forms of sufficient dimensions, shape, and strength to support the concrete laterally for a sufficient length of time during placement to produce pavement of the required cross section. No abrupt changes in longitudinal alignment of the pavement will be permitted. The horizontal deviation shall not exceed 20 mm from the proper alignment established by the Engineer.
E	JOINTS 1. All joints, longitudinal, transverse, etc. shall be constructed as shown on the drawings and shall be clean and free of all foreign material after completion of shoulder work and prior to acceptance of the work, and in accordance with the following provisions: a. Contact Joints Contact joints are those joints made by placing fresh concrete against hardened concrete. b. Contraction Joints (Weakened Plane Joints) Contraction joints shall be formed by cutting a groove in the pavement with a power driven saw at the locations shown on the drawings. The grooves shall be cut to a minimum depth of 50 mm and the width shall be cut to a minimum width possible with the type of saw being used, but in no case shall the width exceed 5 mm. Every fourth planned transverse weakened plane joint in the initial lane of concrete and also the first joint immediately after the transverse contact joint shall be sawed within 24 hours after the concrete has been placed, the exact time to be determined by the Engineer. Every second planned transverse weakened plane joint shall be sawed within 48 hours after placing the concrete, the exact time to be determined by the Engineer. The remaining longitudinal and transverse weakened plane joints may be sawed at such time, after 24 hours, as the Contractor may elect, except they shall be completed before placing concrete in succeeding adjacent lanes and before permitting the Contractor's traffic or public traffic to use the pavement. In succeeding lanes of concrete pavement, the transverse joints opposite those which have opened in the initial lane shall be sawed within 24 hours after the concrete has been placed, the exact time to be determined by the Engineer, but in all cases not more than 3 consecutive planned transverse weakened plane joints shall be omitted. The remaining longitudinal and transverse weakened plane joints may elect, except they shall be completed before placing concrete in the succeeding adjacent land and before permitting the Contractor's traffic of public traffic to use the pavement. No sawing shall be done where transverse cracks exist. If a transverse crack falls within 1.52 m of the location of a propose sawed joint, the sawed joint shall be omitted. Joints sawed in violation of the provisions in this paragraph will not be paid for. At the discretion of the Engineer transverse weakened plane joints may be formed by placing a continuous strip of plastic or other material which will not react adversely with the chemical constituents of the concrete. The strip shall have a minimum thickness of 0.4 mm and a width of not less than 50 mm or more than 55 mm. After placement, the vertical axis of the joint material shall be within 10 degrees of a plane normal to the surface of the pavement. The top of the strip shall not be above nor more than 5 mm below the finished pavement surface. Final alignment of the strip shall conform to that shown on the transverse weakened plane joints and shall not vary more than 20 mm from the edge of a 3 m straightedge. The strip shall be placed by means of a mechanical installation device which shall vibrate the plastic

	concrete sufficiently to cause an even flow of concrete above the joint material. After installation of the joint material, the concrete shall be free of segregation, rock pockets or voids and the finished concrete surface on each side of the joint shall be in the same plane. Splices in the joint material shall not be permitted. The Contractor shall maintain a standby multiple-bladed power joint saw, in operating condition, at the project site at all times while concrete paving operations are underway, regardless of the type of weakened plane joint being constructed. At the discretion of the Engineer, longitudinal weakened plane joints at traffic lanes in multi-lane monolithic concrete pavement may be formed by placing a continuous strip of plastic or other material which will not react adversely with the chemical constituents of the concrete. The joint insert material shall be of such width and character that when placed vertically in the concrete it will not bond with the concrete and will form an effective weakened plane joint of 50 minimum depth. The joint material shall be inserted with a mechanical device that places the material in a continuous strip, except where intervening structures break the continuity of paving. Splices in the joint material will be permitted provided that they are effective in maintaining the continuity of the joint material as placed. The joint material shall be placed in such manner that the top of the strip is not more than 3 mm below the finished surface of the concrete. The joint material shall not be deformed from a vertical position, either in the installation or in subsequent finishing operations performed on the concrete. The alignment of the finished joint shall be uniformly parallel with the center line of the pavement and shall be free of any local irregularity which exceeds 10 mm. The mechanical installation device shall vibrate the concrete during placing the strip sufficiently to cause the concrete to flow evenly about the joint material producing homogeneous concrete free of segregation and rock pockets or voids. c. Expansion Joints Expansion joints shall be formed at structure approaches as shown on the drawings. *Joints with Joint Sealant* At expansion joints in concrete slabs to be exposed, and at other joints indicated to receive joint sealant, pre-molded expansion-joint filler strips shall be installed at the proper level below the elevation with a slightly tapered, dressed and oiled wood strip temporarily secured to the top thereof to form a groove, which when surface dry, shall be cleaned of foreign matter, loose particles, and concrete protrusions, then filled approximately flush with joint sealant so as to be slightly concave after drying. Jointing materials shall be as specified in Sub-section 3.2.2.8. *Finish of concrete at joints* Edges of exposed concrete slabs along expansion joints shall be neatly finished with a slightly rounded edging tool.
F	PLACING CONCRETE The concrete shall be so deposited and spread that segregation will not occur, and a uniform layer of concrete whose thickness is approximately 20 mm greater than that required for the finished pavement. Rakes shall not be used for handling concrete. In order to prevent the introduction into the concrete of earth and other foreign materials, the men whose duties require them to work in the concrete, shall in general, confine their movements to the area already covered with fresh concrete. Whenever it becomes necessary for these men to step out of the concrete, their footwear shall be washed or otherwise thoroughly cleaned before returning to the concrete. During the operation of striking off the concrete, a uniform ridge of concrete at least 70 mm in depth shall be maintained ahead of the strike-off screed for its entire length. Except when making a construction joint, the finishing machine shall at no time be operated beyond that point where this surplus can be maintained in front of the strike-off screed. After the first operation of the finishing machine, additional concrete shall be added at all low places and honeycombed spots and the concrete rescreeded. In any rescreeding, a uniform

	head of concrete shall be maintained ahead of the strike-off for its entire length. Honeycombed spots shall not be eliminated by tamping or grouting. Workers on the job shall have mobile footbridges at their disposal so that they need not walk on the wet concrete. In conjunction with the placing and spreading, the concrete shall be thoroughly spaded and vibrated along the forms, bulkheads, and joints. The internal vibrators shall be pneumatic, gas-driven, or electric type, and shall operate at a frequency of not less than 3,200 pulsations per minute. Whenever the placing of the concrete is stopped or suspended for any reason, for a period of 30 minutes or longer, a suitable bulkhead shall be placed so as to produce a vertical transverse joint. If an emergency stop occurs within 2.5 meters of a contraction or an expansion joint, the concrete shall be removed back to the joint. When the placing of the concrete is resumed, the bulkhead shall be removed and new concrete placed and vibrated evenly and solidly against the face of previously deposited concrete. Any concrete in excess of the amount needed to complete a given section, or that has been deposited outside the forms, shall not be used in the work. The Contractor must provide suitable equipment for protecting the fresh concrete in case of rain, such as screens which will cause the rain water to run off beyond the edges of the paving, rain proof tarpaulins or other methods approved the Engineer. The equipment must be sufficient to shelter from rain an area equal to that paved in two hours of work.
G	FINISHING CONCRETE The concrete shall be compacted and finished by a mechanical, selfpropelled finishing machine of approved type, having two independently operated screeds. If a machine possessing only one screed is adopted, the screed will not be less than 450 mm wide, and shall be equipped with compensating springs to minimize the effect of the momentum of the screed on the side forms. The number of driving wheels, the weight of the machine, and the power of the motor shall be so coordinated as to prevent slippage. The top of the form and the surface of the finishing machine wheels shall be kept free of concrete or dirt. The machine shall at all times be in first-class mechanical condition, and shall be capable of compacting and finishing the concrete as herein described. Any machine which causes displacement of the side forms from the line or grade to which they have been properly set, or causes undue delay due to mechanical difficulties, shall be removed from the work and replaced by a machine meeting the Specifications. The finishing machine shall be operated over each section of pavement two or more times and at such intervals as will produce the desired results. Generally, two passes of the finishing machine are considered the maximum desirable. The concrete shall be vibrated, compacted, and finished by a vibratory finishing machine. The vibratory machine shall meet the requirements for ordinary finishing, and shall be one of the following types: 1. The machine shall have two independently operated screeds, the front screed shall be equipped with vibratory units with a frequency of not less than 3,500 pulsations per minute. There shall be not less than one vibratory unit for each 2.5 meters length, or portion thereof, of vibratory screed surface. The front screed shall be not less than 300 mm wide, and shall be equipped with a "bull nose" front edge built on a radius of not less than 50 mm. This type of vibratory finishing machine shall be operated in such manner that each section of pavement will receive at least one vibratory pass, but not more than two passes, unless otherwise directed, or; 2. The machine shall be equipped with an independently operate vibratory "pan" (or pans) and two independently operated screeds; the "pan" shall be mounted in a manner that will not permit it to come in contact with the forms, and will permit vibration of the full width of the lane simultaneously. There shall be not less than one vibratory unit for each 2 m length, or portion thereof, of vibrating pan surface. The vibratory units in any individual pan shall be synchronized and have a frequency of not less than 3,500 pulsations per minute. The front

	screed shall be capable of operating in a position that will strike off the concrete at a sufficient height above the top of the forms to allow for proper compaction with the vibrating pan. This type of vibratory finishing machine shall be operated in such manner that each section of pavement will receive at least on vibratory pass but not more than two passes, unless otherwise directed the Engineer. After the final pass of the finishing machine, and when the concrete has started to dry, the surface of the pavement shall be finished with an approved longitudinal float. The float may be operated either manually or by mechanical means. The float may be either of wood or metal, shall be straight and smooth and light in weight so as not to displace or sink into the concrete surface. To be effective, the float shall be at least 300 mm wide and 3 m long. When manually operated, the float shall be moved from edge to edge with a wiping motion and advanced 1 meter or more. The succeeding trip shall overlap the previous trip. A light smoothing float at least 3 meters long may be used provided approved by the Engineer. The surface of the pavement shall be tested by the Contractor, before the final belting, with an approved standard straightedge 3 m in length. Irregularities so detected shall be corrected immediately. Special attention must be given to the concrete adjacent to transverse joints to insure that the edges therefore are not above the grade specified, or the adjacent concrete below grade. All depressions or projections discovered shall be corrected before any initial set has developed in the concrete. After the concrete has been brought to the required grade, contour, and smoothness, it shall be finished by passing over the concrete a drag of one or two burlap cloths, which give the surface the required roughness. The vehicle used to carry these clothes may be independent of the concrete laying machine or may be incorporated with it, and may be operated either by hand or mechanically. Hand finishing will be permitted only on variable width sections of the pavement and other places where the use of the finishing machine would be impracticable. Hand finishing shall be accomplished by means of the hand operated strike-off template of either steel or steel-shod wood construction. The striking template shall be operated forward with a combined longitudinal and transverse motion, and shall be so manipulated that neither end will be raised off the side forms. A similar tamper shall be used for tamping the concrete. As soon as the concrete has attained its initial set, the edges of the pavement, the longitudinal joints, the construction dummy, and expansion joints not sawn shall be carefully finished with an edging tool having a radius of at least 5 millimeters. The tools, the special accessories for cutting impressed joints, and methods of workmanship shall be such as they will produce a joint whose edges are of the same quality of concrete as the other portions of the pavement. Methods and workmanship which make use of excess mortar or grout in this area shall be eliminated. Unnecessary tool marks shall be eliminated during construction, and the edges left smooth and true to line.
H	STRIKING FORMS Forms shall remain in place at least 12 hours after the concrete has been placed. When working conditions are such that the early strength gain of the concrete is delayed, the forms shall remain in place for a longer period, as directed by the Engineer. Bars or heavy loads shall not be used against the concrete when still in the forms. Any damage to concrete resulting from removal shall be repaired promptly by the Contractor as directed by the Engineer without any additional payment.
I	CURING CONCRETE Unless otherwise ordered by the Engineer, curing concrete shall be done by the curing compound method in accordance with the curing concrete requirements in Section 3.2. Curing concrete by the other curing concrete methods shall conform with the curing concrete requirements in Section 3.2.
J	CLEANING AND SEALING JOINTS

	After completion of the required curing and before opening of the pavement to traffic, all joints shall be thoroughly cleaned of all concrete aggregate fragments or other material. After removal of side forms, the ends of transverse expansion joints at the edges of the pavement shall be carefully cleaned of any concrete within the expansion spaces for the entire depth of slab, care being taken not to injure the ends of the joints. Expansion and contraction joints shall then be poured with a hot joint sealer to the depth as indicated on the drawings. Joint sealer shall be poured using approved hand pouring pots, with liquid at a temperature not less than that recommended by the manufacturer.
K	OPENING TO TRAFFIC The pavement shall be closed to traffic, including the vehicles of the Contractor, for a period of 21 days after the concrete is placed, or longer if, in the opinion of the Engineer, the weather conditions make it necessary to extend this time. The Contractor shall furnish, place and maintain satisfactory barricades and lights as directed, to exclude all traffic from the pavement. Any damage resulting to the pavement due to traffic shall be repaired or replaced at the expense of the Contractor. Paving mixers, mechanical concrete spreaders and finishers and other heavy paving equipment shall not be operated on completed concrete lanes in order to construct alternate lanes until after the regular curing period is completed. Even then, planks shall be laid on the finished pavement or other precautions taken to prevent damage to the concrete slab.
L	PAVEMENT SMOOTHNESS, THICKNESS AND TOLERANCE The cement concrete pavement shall be laid to the designed level and transverse slope shown on the drawings. The allowable tolerance shall be in accordance with tolerance for cement concrete pavement under **Table 5.12.2**.

1.5 MEASUREMENT AND PAYMENT

A.	1. The quantities of Portland cement concrete pavement to be paid for shall be measured by the area of the top surface, in square meters, calculated from its width and length of the designated thickness as shown on the drawings. 2. No separate measurement shall be made for individual items of Portland cement concrete pavement such as formworks, dowel bars, joint sealer, joint filler, pavement markings, etc., as such shall be considered incidental to Portland cement concrete paving work described above. 3. The above quantities shall be paid for based on the quantities measured as provided above at the appropriate contract unit price for each of the particular pay items shown in the Bill of Quantities which price and payments shall be full compensation for all the costs of furnishing, placing, compacting and shaping material including all labor, equipment, tools and incidentals necessary to complete the work prescribed in this section.

SECTION 09
REINFORCEMENTS

1.1 GENERAL

A.	Division 1 "General Requirements" contain provisions and requirements essential to these Specifications; and apply to this Section, whether or not referred to herein.

1.2 DESCRIPTION

A.	This work shall consist of fabrication and installation of reinforcements on Portland cement concrete pavement on a prepared base for roads and parking area in accordance with the Specifications and the Drawings. The Contractor shall submit his proposed method of construction of cement concrete pavement including materials, equipment, and all related works for the approval of the Engineer.

1.3 MATERIAL REQUIREMENTS

A.

1. Reinforcement: Fabricated to shapes and dimensions shown and shall be placed where indicated. Reinforcement shall be free of loose or flaky rust and mill scale, or coating, and any other substance that would reduce or destroy the bond. Reinforcing steel reduced in section shall not be used. After any substantial delay in the work, previously placed reinforcing steel for future bonding shall be inspected and cleaned. Reinforcing steel shall not be bent or straightened in a manner injurious to the steel or concrete. Bars with kinks or bends not shown in the drawings shall not be placed. The use of heat to bend or straighten reinforcing steel shall not be permitted. Bars shall be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items. If bars are moved more than one bar diameter, the resulting arrangement of bars including additional bars necessary to meet structural requirements shall be approved before concrete is placed. In slabs and pavements reinforcing steel shall not be spliced at points of maximum stress unless otherwise indicated.

   Unless otherwise shown in the drawings, laps or splices shall be 40 times the reinforcing bar diameter.

2. The nominal dimensions and unit weights of bars shall be in accordance with the following table:

Nominal Diameter (mm)	Nominal Perimeter (mm)	Nominal Sectional Area (sq mm)	Unit Weight (kg/m)
6	18.8	28.27	0.222
10	31.4	78.54	0.616
12	37.7	113.10	0.888
16	50.3	201.10	1.579
20	62.8	314.20	2.466
25	78.5	490.90	3.854
28	88.0	615.70	4.833
32	100.5	804.20	6.313
36	113.1	1017.60	7.991
40	125.7	1256.60	9.864
50	157.1	1963.50	15.413

3. Welding of reinforcing bars shall only be permitted where shown; all welding shown shall be performed in accordance with AWS D 12.1.

4. Exposed reinforcement bars, dowels and plates intended for bonding with future extensions shall be protected from corrosion.

5. Supports shall be provided in conformance with ACI 315 and ACI 318, unless otherwise

indicated or specified.

6. Concrete Protection for Reinforcement

a. The minimum concrete cover of reinforcement shall be as shown below unless otherwise indicated in the drawings.

b. Tolerance for Concrete Cover of Reinforcing Steel other than Tendons.

Minimum Cover	Maximum Variation
7.5 cm or more (marine structures and concrete cast against and permanently exposed to earth)	9 mm
less than 7.5 cm (other structures)	6 mm

1.4 MEASUREMENT AND PAYMENT

A.	Measurement Reinforcements shall be measured by the kilograms (kg). The quantity to be paid for shall be the total weight of reinforcements in place as shown on the Drawings,
B.	Payment The accepted quantities measured shall be paid for at the contract unit price for reinforcement which price and payment shall be full compensation for furnishings and placing all materials, including all labor, equipment, tools and incidentals necessary to complete the work prescribed in this Section.