



Republic of the Philippines
NATIONAL POLICE COMMISSION
PHILIPPINE NATIONAL POLICE
ENGINEERING SERVICE
REGIONAL PROJECT MANAGEMENT UNIT 11
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PROJECT TITLE : CONSTRUCTION OF ROAD NETWORK AT DAVAO OCCIDENTAL PPO CAMP

LOCATION : Brgy Kidalapong, Malita, Davao Occidental

SCOPE OF WORK

The construction procedures shall be done in accordance with the DPWH Standard Specifications Volume II, 2004 Edition, and in full compliance with the approved plans and specifications.

Pertinent notes appearing in the Contract Plans or Drawings shall also be considered as part and parcel of the technical specifications. Such notes shall take precedence over the General Specifications.

Part – A – FACILITIES FOR THE ENGINEER

A(8) Progress Photographs

The Contractor shall provide progress photographs taken as, when and where directed by the Engineer at intervals of not more than one month. The photographs shall be sufficient in number and location to record the exact progress of the Works.

The Contractor shall provide one proof print of each photograph taken, and the negative and ten copies, not less than 254 mm x 203 mm and printed on glossy paper, of any of the photographs selected as progress photographs by the Engineer.

The photographs retained by the Engineer will become the property of the Government and the Contractor shall supply approved albums to accommodate them. Two copies are to be signed by the Contractor, one of which will be signed by the Engineer and returned to the Contractor.

The quantities for progress photographs shall be the number of photographs selected and provided as progress photographs. The unit of measure is 'each'.

Part – B – OTHER GENERAL REQUIREMENT

Traffic Control

The Contractor shall furnish and install and maintain at all times during the duration of the Contract, at his own expense, necessary traffic signs, barricades, lights, signals and other traffic control devices and shall include flagging and other means for guidance of traffic thru the work zone.

Traffic control shall be done in accordance with prevailing government rules and regulations and with the design details included in the Plans where applicable.

Survey / Setting Out

The Contractor shall set out the Works in relation to survey stations, markers, reference pegs and bench marks which have been established. Great importance is attached to these stations and the Contractor shall safeguard and protect them from harm or loss at all times until completion of the Works.

The Contractor shall be responsible for the re-establishment of any that have to be moved and for the establishment of any further survey stations, markers, reference pegs, and bench marks as are necessary for the proper setting out and control of the Works.

Stations and bench marks established by the Contractor shall be made of steel pins, 450 mm long and 12 mm diameter, set 12 mm in-situ Class B concrete blocks cast 0.25 mm into the ground and at least 0.25 inch diameter. The stationing shall be scratched or clearly marked to the satisfaction of the Engineer.

In carrying out this task the Contractor shall provide at his own cost a minimum Surveying/levelling equipment and the required personnel to adequately run the surveys work. Should the Contractor discover any error in the line or level in the basic setting out, he shall at once notify the Engineer who will then issue amended drawings or instructions regarding the correction of the error.

Field Office / Temporary Shelter

The Contractor shall also provide at his own cost a field office/temporary shelter. The location dimensions and layout of such buildings and places shall be subject to the approval of the Engineer. The Contractor shall not be permitted to erect temporary buildings or structures on the site without the specific permission in writing of the Engineer including approval of the dimensions of such buildings or structures.

Pay items shall not be provided for works under Part B – Other General Requirements. Payment for them shall be deemed to be included in the pay items for other works.

PART - C – EARTHWORKS

ITEM 101 Clearing and Grubbing

Clearing and grubbing shall be performed within the construction limits of the project, within the right-of-way limits or shall be extended 3.0 meters beyond the toe of the fill slope as may be decided or designated by the Engineer.

On areas required for roadway or structural excavation, all slumps, roots, etc., shall be removed to a depth of at least 30 cms., below the finished surface of the required cross-section, except that grubbing will not be required where cuts exceed 1.00 meter in depth, provided that no roots, stumps or other objectionable matters will be incorporated in the embankment.

On areas required for embankment construction, all stumps, roots, etc., shall be removed to a depth of 30 cm. below the existing ground surface, except that grubbing will not be required where fill exceeds 1.00 meter in height, provided that no roots, stumps, or other objectionable matters will be incorporated in the embankment.

When the roadway extends to plantings of coconut trees, the roots of these trees shall be removed from the soil to a depth of 30 cms. below the top of the subgrade, volume occupied by the roots shall be replaced with approved materials.

Also included in the clearing and grubbing operations shall be the removal of all existing pavements, removal of all trees, houses, fences and the like as directed by the Engineer. All ditches, streams, ponds, etc., in the embankment area shall be properly cleared prior to backfilling.

All of these cleared materials such as small trees, stumps, branches, bamboos, grasses, pavements and litters shall be disposed of outside the road-right-of-way limits or at other locations where they will not be visible from the completed road or shall be removed or deposited at a site or hauled to a disposal area designated by the Engineer.

All other structures to be removed aside from mentioned within the limits of construction as indicated on the Drawings or as directed by the Engineer, which obstruct or interfere with the prosecution of the works, shall be removed, reinstalled, hauled and stockpiled as the case maybe in accordance with this Specification or as directed by the Engineer.

102(2) Surplus Common Excavation

Prior to beginning roadway and drainage excavations, all necessary clearing and grubbing shall have been performed already and such cleared materials have already been disposed of , so that work on roadway and drainage excavation could already be started.

All excavation shall conform to the lines, and grades shown on the approved Plans or established by the Engineer. It shall be finished to reasonably smooth and uniform surfaces and no materials shall be wasted without authority of the Engineer.

Excavation operations shall be conducted so that materials outside of the limits will not be disturbed. All suitable materials removed from excavation shall be used in the formation of the embankment, subgrade, slopes, backfill for structures, and for other purposes.

Common Excavation

This consists in excavations of suitable materials along the roadway as indicated in the plans and cross sections and such excavated materials shall be used in the formation of embankments, subgrade, slopes, bedding, backfill for culverts, etc. No excavated materials shall be wasted without the knowledge of Regional Engineer. During the progress of the excavation, materials taken from the cuts and deemed suitable for placing in the roadbed or for subgrade or for road metalling shall be saved and utilized for these purpose.

Excavation of Unsuitable Materials

This shall consist of the excavations of materials which cannot be satisfactorily compacted or unsuitable for foundations, roadbed or other roadway purposes. Before starting filling operations of suitable materials, all unsuitable materials on the proposed roadway shall be removed first.

Materials encountered in excavating the roadway which are unsuitable shall not be used for backfilling, embankments, subgrade or on shoulders, but shall be disposed of.

Where unsuitable material is present at or below the subgrade elevation or where the unsuitable material encountered in excavating the roadway extends to thereat, which, in the judgment of the Regional Engineer should be removed, it

shall be excavated to the depth directed by the Engineer and the spaces created by the removal of unsuitable material should be backfilled with approved materials.

103(1) Structure Excavation (including Pipe Culvert and Drain Excavation)

This Item shall consist of the necessary excavation for foundation of culverts, underdrain, and other structures not otherwise provided for in the Specifications. Except as otherwise provided for pipe culverts, the backfilling of completed structures and the disposal of all excavated surplus materials, shall be in accordance with these Specifications and in reasonably close conformity with the Plans or as established by the Regional Engineer.

Prior to starting excavation operations in any area, all necessary clearing and grubbing in that area shall have been performed in accordance with item 100, Clearing and Grubbing.

This item shall also include necessary diverting of live streams, bailing, pumping, draining, sheeting, bracing, and the placing of all necessary backfill. The interior dimensions for reinforced concrete culvert pipes excavations like trenches or foundation pits for structures or structure footings shall be such as to give sufficient clearance for the construction of forms, and also to facilitate the removal of forms after the completion of the structure. They shall be of sufficient size to permit the placing of structures or structure footings of the full width and length shown. Any excavation carried beyond the limits shown or described on the drawings or specifications or beyond the dimension resulting from adjustments made by the Engineer shall be backfilled with materials acceptable and as directed by the Engineer.

The volume of excavation to be paid for will be the number of cubic meters measured in original position of material acceptably excavated in conformity with the plans or as directed by the Engineer.

Unless otherwise provided, forms with all sheetings and bracings shall be removed after the completion of the structures, the removal shall be effected in such a manner as not to disturb or mark the finished masonry. Pumping from the interior of the form enclosure shall be done in such a manner as to preclude the possibility of any portion of the concrete materials being carried away. No pumping will be allowed during the placing of concrete, or for a period of 24 hours thereafter, unless it be done from a suitable pump separated from the concrete work by a watertight wall.

104(1) Embankment from Roadway Excavation

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. Embankment shall be constructed of suitable in place and accepted by the Engineer.

105(1) Subgrade Preparation

Prior to commencing preparation of the subgrade, all drainage structures, inlets, manholes drains and drainage outlet shall be completed. Any work on the preparation of the subgrade shall not be started unless prior work herein described shall have been approved by the Engineer. After embankment has been completed, the full width shall be conditioned by removing any soft or other unstable material that will not compacted properly. The entire roadbed shall be shaped and compacted to the requirements specified on the plan.

Backfill material shall consist of aggregate sub-base materials placed and compacted in 20 cms layers. Backfilling in areas inaccessible to rollers shall be compacted in horizontal layers of not more than 30 cms. in thickness, loose measurement by means of mechanical or hand tamper. Hand tamper when used, shall be heavy iron tampers having an area of not more than 160 square centimeters.

PART – D - SUBBASE AND BASE COURSE

Item 108 Aggregate Sub-base

Before extracting materials from the proposed sources, borrow pits shall be cleared and grubbed and the over-burden top soil materials which are unsuitable as aggregate sub-base material, shall be stripped and disposed of. After the necessary clearing, the limits or dimension of the borrow pit is determined and necessary stakings and reference points are made. Excavations should not go beyond the maximum depth specified. The depth of the excavation, throughout the area shall be as uniform as practicable and the side slopes shall be dressed to such slope to be uniform as possible to facilitate easy computation of the volume extracted.

No aggregate sub-base material should be placed along the roadway, unless the foundation or borrow materials have already been tested and passed compaction requirements.

Sub-base materials shall be placed and compacted in layers, it shall be spread in successive horizontal layers of not more than 20 cms. in thickness (loose measure) for the full width of the cross-section and shall be rolled. The moisture content of the material at the time of rolling shall be near the optimum moisture as determined in the laboratory. Each layer shall be compacted by rolling. The degree of compaction in each layer is determined by the standard field density

test. Each layer shall be compacted by rolling. The degree of compaction in each layer is determined by the standard field density test. Each layer should attain the required percentage of compaction before the next layer is allowed in place.

The contractor shall be paid by the unit price per cubic meter of aggregate sub-base course, including filler materials and shall also constitute full compensation for furnishing the materials, hauling, placing, watering, rolling, labor, equipment, tools and incidentals necessary to complete the item.

Item 110 Foundation Fill

After the completion of the necessary excavations for required structures, and the unsuitable materials has been removed, the resulting subgrade shall be free from vegetable matters, lumps or balls of clay and other deleterious substance and should be compacted first before the foundation material is placed. The material shall be of such nature that it can compacted readily to form a firm, stable base The foundation fill should be placed and spread in uniform layers not to exceed 15 cms up to the required elevation and thoroughly compacted. The moisture content of the 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. Compaction of each layer shall continue until a field density of at least 100 percent of the maximum dry density.

PART – E - SURFACE COURSES

Item 311(1) Portland Cement Concrete Pavement

Materials

Only Type I Cement shall be used unless otherwise provided for in special Provisions. Different brands or same brands from different mills shall not be mixed nor shall they be used alternatively unless the mix is approved by the Engineer. Cement which for any reason, has become partially set or which contains lumps of caked cement will be rejected. Cement salvaged from discard or used bags shall not be used.

Proportioning, Consistency and Strength of Concrete

The contractor shall prepare the design mix. 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 all 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 (1/2 1-1/2 inches) if not vibrated, and a flexural strength of not less than 3.8 MPa (550 psi) when tested by the mid-point method at

fourteen (14 days) or a compressive strength of 24.1 Mpa (3500 psi) for cores taken at fourteen (14) days.

Water used in mixing, curing or other designated application shall be reasonably clean and free from oil, salt, alkali, grass or other substances injurious to the finished product. Water shall 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 so to exclude silt, mud grass or other foreign materials.

Joint fillers

Poured joint fillers shall be mixed asphalt and mineral conforming to the specifications.

Paving and Finishing Equipment

The concrete shall be placed with an approved paver designed to spread, consolidate, screed and float finish the freshly placed concrete in one complete pass of the machine in such a manner that a minimum of hand finishing will be necessary to provide a dense and homogeneous pavement on conformance with the Plans and Specifications. The finishing machine shall be equipped with at least two (2) oscillating type transverse screed.

Vibrators shall operate at a frequency of 8,300 to 9,600 impulses per minute under load at a maximum spacing of 60 cm.

Concrete Saw

The Contractor shall provide sawing equipment in adequate number of units and power to compete the sawing with the water-cooled diamond edge saw blade or an abrasive wheel to the required dimensions and at the required rate. He shall provide at least one (1) stand-by saw in good working condition and with an ample supply of saw blades.

Forms

Forms shall be of steel, of an approved section, and of depth equal to the thickness of the pavement edge. The base of the forms shall be sufficient width to provide necessary stability in all directions. The flange braces must extend outward on the base to not less than $\frac{2}{3}$ the height of the form. All forms shall be rigidly supported on bed of thoroughly compacted material during the entire operation of placing and finishing of concrete. Forms shall be provided with adequate devices for secure setting so that when in place, they will withstand, without visible spring or settlement, the impact and vibration of the consolidation and finishing or paving equipment.

Weakened Plane Joint

When shown on plans, it shall consists of planes of weakness created by forming or cutting grooves in the surface of the pavement and shall include load transfer assemblies. The depth of the weakened plane joint should at all times not be less than 50mm, while the width should not be more than 6 mm

Construction Procedures

A. Preparation of Roadbed

The existing roadbed shall have been already tested and passed the required degree of compaction before any concrete pouring shall be made. No form setting will be allowed unless laboratory compaction test have been conducted and shown satisfactory results. After the roadbed has been compacted, it shall be trimmed to approximately correct elevation and cross-section extending the work at least sixty (60) cms. on each side of the pavement width.

When placing the forms, care should be taken that the foundation under the forms shall be properly compacted and shaped true to grade. The form must be seated firmly and be in contact for its entire length at exactly the desired line and grade. Any roadbed, which at the form line is found below established grade, shall be filled with approved granular materials.

After the forms have been properly set and the roadbed shaped and rolled, it shall be tested as to crown and elevation. Before placing concrete, by means of an approved template held in a vertical position and moved backward and forward on the forms. All excess materials as indicated in this template shall be removed, and all depressions shall also be filled and compacted to grade level.

The roadbed shall be moist but not unstable, at the time of placing the concrete pavement. The roadbed shall be saturated the previous night or at least six (6) hours before the placing of the concrete. However, excessive sprinkling should be avoided so as not to create an unstable roadbed.

B. Forms and form Setting

Wooden side forms are permitted, shall be apitong or lauan or better, shall have a thickness of at least 3 inches and a depth equal to the thickness as specified on the plans and cross-sections. It shall not be less than twenty (20) centimeters or more in height. It shall be kept oiled or greased at all times to prevent warping and cracking. Flange braces shall extend outward on the base not less than two-thirds of the height of the form. It should be of sufficient strength when put in place to resist the pressure of the concrete mixer and finishing machine or finishing tools without springing.

Before concrete shall be mixed, forms shall be set in place for at least one hundred (100) meters in advance at the point where concrete is being poured. Forms filled with concrete should not be removed within twenty four (24) or more hours after the concrete has been poured, so that, sufficient forms shall be prepared in order that the concreting work will go on continuously. All forms shall be cleaned and oiled each time they are used.

Side forms shall be set firmly and exactly to the required alignment and grade of the pavement and joined neatly and tightly and be supported in such position, so that they shall not at any time deflect as much as one (1) centimetre vertically or horizontally from the required line and grade. The alignment and grade of all forms should be checked first before placing the concrete.

C. Handling, Measuring and Batching Materials

The location, preparation of the site, size of available spaces, nearness to the batching plant, method to be adopted to prevent coning or segregation of component sizes are some of the considerations in stock-piling concrete aggregates.

Aggregates that have become mixed with earth or foreign materials shall not be used. Stockpiles of the different sizes of aggregates shall be located far enough apart to prevent mixing of the different sizes and shall be placed only on a clean and dry stable foundation.

There are two methods used in measuring materials, by weight and by volume method. The scales should be properly tested and calibrated first before use. If suitable weighing devices are not available, and procurement of the weighing machine may cause delay in the paving schedule, proportioning by volume may be allowed. In such case, measurement will be based on the approved design mix proportions per bag of cement. Equivalent weights of fine and coarse aggregates as determined in the design-mix per bag of cement will be measured by loose volumes in boxes or similar containers with previously pre-determined capacities. Measurement by wheelbarrow volumes will not be allowed.

A batching plant when used, shall include batcher bins, having adequate separate compartments for fine and coarse aggregates, it shall include scales and weighing devices properly calibrated and tested before its actual use. Batching plant should also be provided with attached belt-conveyors for transporting concrete materials up to the plant such as cement, sand and gravel. In emptying cement bags, necessary precautions should be exercised so as to prevent unnecessary loss of cement, which might be due to spillage, strong wind, etc.

D. Mixing Concrete

Hand mixing of concrete is not permitted in road construction projects. Machine mixing of concrete shall be done in a standard mixer of an approved type and capacity, such mixer shall be provided with a water measuring equipment which shall accurately measure and discharge the amount of water required for each batch and shall at all times be maintained without leakage and in good condition always.

E. Truck Mixing

Truck Mixers or Transit Mixers shall be of the revolving drum type, water tight and so constructed that the concrete can be mixed to insure uniform distribution of materials throughout the mass. Concrete aggregates shall be accurately measured and charged into the drum at the proportioning plant. The Transit mixer shall be equipped with a water tank and only the prescribed amount of water shall be placed in it. The mixing water may be added directly to the batch in which case, the water in the tank may be used for necessary water adjustments before discharging the concrete mix.

Concrete shall be mixed thoroughly for a period of not less than one (1) minute after all component materials including water are in the drum, if the mixer used in 0.80 cu.m. or less. If the mixer used is more than 0.80 cu.m. capacity, the mixing period shall be increased by 15 seconds for each cubic meter of fraction thereof.

During mixing, the drum shall be operated at drum speeds specified by the manufacturer or at a speed of 14 to 20 revolutions per minute.

At the end of everyday's pouring or when the pouring is temporarily stopped for any considerable length of time, the mixer shall be cleaned thoroughly. Upon resumption of mixing, the first batch of materials placed in the mixer shall contain sufficient sand, cement and water to coat the inside surface of the drum without diminishing the required mortar content of the mix. The usual practice is to provide additional one (1) bag of cement in excess of the required usual number of bags of cement per batch based on the approved design-mix.

Concrete not in place within 90 minutes from the time the ingredients were charged in to the mixing drum, shall not be accepted. The retempering of concrete or mortar which has partially hardened, that is remixing with or without additional cement, aggregate or water shall not be permitted.

F. Proportioning of Concrete

The actual mixing proportions to be followed are the results of the Design Mix, based on laboratory tests. The actual equivalent weight of sand and gravel per bag of cement are determined and trial mix samples are prepared out of theses proportions and tested in the laboratory for the specified flexural strength. If

these trial samples fail to meet the required strength, a re-design of the mix will be made until such time that the samples will attain the required modulus or rupture of 600 lbs per square inch at 28 days.

The maximum net water content shall be 6 gallons per bag of cement and the slump shall be within the range of 2 to 3 inches (5 to 7.5 cms.).

G. Placing Concrete

Before pouring concrete, the existing base should first passed the required compaction test. At least one hundred (100) meters length of roadbed shall have been prepared ahead of the mixer. The mixed concrete shall be deposited on the roadbed in such a manner as to require as little handling as possible, and shall be immediately distributed or spread by shoveling or by any other method, to such depth, a little bit above grade, that when finished, the required thickness will be obtained at all points. Concrete shall be thoroughly consolidated, using vibrators to avoid honeycombing.

Workmen shall not be allowed to work in the newly poured concrete with boots or shoes coated with earth or other foreign substances. Placing of concrete shall be continuous up to the last construction joint which are regularly spaced at 4.5 meters between each joint, however, if there is any surplus of concrete the header may be placed one-third or two-thirds of the succeeding block and the necessary dowels are provided.

H. Test Specimens

For every 75 cu.m. of concrete poured or fraction thereof, two (2) sets of 3 pcs 6"x6"x21" beam samples will be prepared to represent the concrete placed on each day. One set of specimen shall be cured as the pavement is cured to determine when the pavement is to be opened to traffic. The other set of samples shall be cured by laboratory method to verify the strength of the concrete per design mix. Test samples should be prepared by the contractor under the supervision of the Engineer.

I. Night Concreting

Concreting work may be allowed during night time, especially projects which are behind schedule, provided adequate lighting facilities are present and provided also that such operations are duly supervised with the presence of both the contractor and the Engineer or their authorized representatives. However, night operations shall be discontinued due to insufficient lighting as determined by the Engineer.

J. Handling and Placing Reinforcement

Tie bars and dowels shall be placed as indicated on the plans. Tie bars shall be placed across longitudinal and transverse contact joints and held in position, at the spacing shown, by chairs or other supports placed at both ends. Tie bars shall be deformed steel bars of the diameter and length shown on the plans and shall not be painted, greased or enclosed in tubes or sleeves.

K. Weakened Plane Joints

Weakened plane joint is formed by cutting a groove in the pavement with a power driven saw at the location shown on the plans. Usually spacing of joints are 4.5 meters on centers. The grooves shall be cut to a minimum depth of 2 inches and the width shall be the minimum width possible with the type of concrete saw being used, but in no case shall the width exceed $\frac{1}{4}$ inch.

The transverse weakened plane joints shall be sawed after 24 hours after the concrete was placed and sawing of these joints shall be completed before placing concrete in succeeding adjacent lanes and also before permitting the contractors traffic or public traffic to use the pavement.

No sawing shall be done where volunteer transverse cracks exists. If a volunteer transverse crack falls within 5 feet of the location of a proposed sawed joint, the sawed joint shall be omitted.

Should the pavement have been applied by a curing compound, all portions of the coating which have been disturbed by sawing operations should be restored by applying curing compound on the affected areas.

A stand-by power concrete saw must be provided in the project at all times when concrete paving work is in progress.

L. Finishing Concrete

Finishing concrete may either be accomplished by a concrete-machine finisher or by ordinary hand finishing. When using a concrete-machine finisher, the concrete shall be distributed or spread as soon as placed. The concrete shall be struck-off and screeded by the mechanical concrete spreader. The striking-off and spreading shall conform to the crown and cross section shown on the plans and shall be done at such elevation slightly above grade that when properly consolidated and finished, the surface of the pavement will be at the elevation indicated on the plans and free from porous areas.

The finishing machine shall be of the vibrating, screeding and troweling type designed and operated both to strike off and to consolidate. The machine shall go over each area of pavement as many times and at such intervals as necessary to give the proper compaction and to leave a surface of uniform texture true to grade and contour. At least two strips will be required but if necessary to insure the required density and finish, additional screeding will be

required. Prolonged operation over a given area shall be avoided. The compacting and finishing operations shall be at all times to produce a satisfactory surface true to grade and elevation. If, in the opinion of the Engineer, a satisfactory surface is not being produced, paving operations shall be stopped by him and the contractor will not be permitted to proceed until satisfactory results are assured.

The concrete finishing machine shall be durable to withstand severe use and shall be fully and accurately adjustable for loss of crown, or other derangement due to wear.

When suitable finishing machines are unavailable, hand finishing of fresh concrete may be tolerated as an alternative, if approved by the Engineer. After the concrete has been placed in the forms, it shall be rodded or vibrated and struck off slowly and carefully with a strikeboard (or tamper) of approved design, beginning with the concrete first poured. The strikeboard shall be applied once or twice until the surface of the concrete is fairly smooth and about one and one-half (1 ½) centimeters higher than the top of the side forms to permit tamping. In making the strike-off, the template shall be moved forward with a combined longitudinal and transverse shearing motion moving always in the direction in which the work is progressing and shall be so manipulated that neither end is raised from the side forms during the striking-off process, Any depression shall be promptly filled with fresh concrete.

The entire surface after the striking-off shall then be tamped and the tamping operations continued until the required compaction and the reduction of surface voids are obtained.

The "Tamper" shall be durably constructed made of hardwood lumber with a width of 10 centimeters or made of steel of channel cross-section, fifty (50) centimeters longer than the proposed width of the pavement slab and sufficiently strong and rigid to retain its shape under all working conditions.

M. Floating

After striking-off and consolidating the concrete, it shall be further smoothed and consolidated with a mechanical or hand-operated longitudinal float. The hand-operated float shall not be less than three (3) meters in length and fifteen (15) centimeters in width, properly stiffened to prevent flexibility and warping.

Floating is done, with the floater standing at the edge side of the pavement, operating the float, starting from the centerline working with a sawing motion passing gradually up to the edge of the side forms.

Floating operations may also be done using temporary foot bridges resting on the side forms and spanning but not touching the concrete, this serves as the mean access of the floater especially on wider span of concrete lanes. An excess water or soupy material shall be wasted and deposited over or outside the side forms on each pass.

N. Straightedging

After the completion of floating and removal of excess water, while the concrete is still plastic, the slab surface shall be tested for smoothness or levelness with a straightedge. An accurate three (3) meter straightedge swung from the handles long enough to insure proper handling. The straightedge shall be held in successive positions parallel to the road centerline in contact with the surface and the whole area gone over from one side of the slab to the other as necessary. If any portion of the surface shows a variation of five (5) millimetre or more from a three (3) meter straightedge, it shall be trimmed off and the fresh concrete immediately floated into the surface to give the pavement the desired grade, cross-section and smooth rising quality.

O. Belting

Before the concrete will develop initial setting, after the straightedging and the removal of excess water, the surface shall be belted with 2-ply canvass belt having a width of not less than fifteen (15) centimeters and a length of at least fifty (50) cms more than the width of the pavement. Suitable handles are provided on these belts to permit controlled uniform manipulation. The belt shall be operated with strokes transverse to the road centerline and with a rapid advance parallel to the centerline. Belt operators must be skilled laborers experienced for the particular kind of work for satisfactory results and ease and uniformity of the resulting concrete rising surface.

P. Removal of Forms

After the concrete is placed in the forms, such forms shall be undisturbed and remain in places for not less than twenty four (24) hours. In the removal of these side forms, crawbars should be used in pulling out nails and pins, exercising extra care so as not to break the edges of the concrete pavement. In case any portion of the concrete pavement is destroyed, it shall be immediately repaired with fresh mortar mixed in the proportions of one (2) psart cement and two (2) parts fine aggregates. Major honeycomb areas, if present will be removed and replaced. Any area or section so removed shall not be less than the distance between weakened plane joint nor less than the full width of the lane involved.

Q. Curing and Protection of Concrete

After the completion of the finishing operations and the concrete has sufficiently set to prevent marring of the surface, the next step is to cure the concrete. Several procedures are employed in curing concrete, such as, by the use of cotton or jute mats, waterproof paper, plastic materials or by the use of curing compounds. For simplicity, the most common practice in curing concrete pavement are:

1. By the use of sprinklers

An ordinary sprinkler is used to sprinkle the surface two (2) or three (3) times a day, or any containers such as empty kerosene cans or asphalt drums, which are filled with water are used in curing concrete pavement. Water trucks provided with hoses are also used.

2. By covering with a burlap

The pavement shall be covered with wet burlap or canvass, which shall be kept wet for a period of 14 days. The strips of burlap must be laid to overlap 15 cms. or more to prevent the occurrence of gaps during the curing which might destroy the fresh concrete.

3. By covering with a 4 cms layer of wet sand, earth or sawdust

The pavement shall be covered with a 4 cms layer of wet sand, earth or sawdust which shall be kept wet for a period of not less than 14 days.

4. By “ponding” method

After the removal of the side forms, create a shallow pool of water over the surface of the concrete pavement. The edges of the pavement shall be banked with earthen material, sand or sawdust, then the ponds are filled with water for a period of 14 days.

5. By the use of curing compounds

If so specified, fresh concrete shall be cured by the use of special curing compounds. This consist of a colorless impervious liquid placed in can containers. The liquid shall be applied under pressure with a spray nozzle in such a manner as to cover the entire pavement with a uniform film and shall be of such character that it will harden within thirty (30) minutes after application. The rate of application is usually prescribed in the “brochure” supplied by the manufacturer or dealer of said curing compounds. In the absence of a “brochure”, the amount of liquid to be applied shall be enough to seal the surface of the pavement thoroughly. The liquid shall be applied immediately after the finishing of the surface and before the set of the cement has taken place.

For the protection of fresh concrete, suitable barricades shall be installed and maintained. These barriers shall be so arranged so as not to interfere with or impede public traffic on any lane which are already opened to traffic, and necessary signs and lights are provided. If it is necessary to provide for traffic across the pavement, construct suitable and substantial crossing to bridge over the concrete pavement, which should be adequate for the traffic.

Watchmen are also assigned to exclude traffic from the newly constructed pavement and also to prevent animals, such as dogs, carabaos, and others from passing or entering on the newly paved concrete.

R. Cleaning and Sealing Joints

The next step after the completion of the required curing operations is the cleaning and sealing of all joints. This should always be done before opening the pavement for vehicular traffic.

All joints shall be thoroughly cleaned of all concrete chips, aggregate fragments, dirt or other materials. These joints shall then be poured with a hot-asphalt joint filler to the depth as indicated on the plans. Joint filler materials shall be poured using approved hand pouring pots, with the asphalt at a temperature not less than 150c deg C (300 deg F) and with the joints clean and dry.

S. Opening to Traffic

During the curing operations, the pavement shall be closed entirely to all traffic and shall not be opened until 14 days have elapsed since the concrete was poured, provided the minimum modulus of rupture strength of 550 psi is obtained. If the strength is already attained in less than 14 days, the pavement may be opened to traffic at such earlier date, however, if the strength is not attained within 14 days, the pavement, shall remain closed to traffic until such time when the required strength is already attained but not to exceed the maximum of 28 days.

Before opening to traffic, shoulders of the pavement shall first be completed, the construction of the shoulders should immediately follow as close as possible after the completion of the pavement.

T. Pavement Thickness

After the completion of the concrete pavement, before the contractor could be given the final payment for the item, a core drilling test will be conducted first on the entire stretch of the completed pavement at such points as the Engineer

may select, six (6) or more cores shall be taken and measured per kilometre of pavement.

The thickness of the slab will be determined by average caliper measurement of thickness of cores between the center points at the base and at the top of the core.

Pavement having average thickness within one-half (1/2) cms. less than the required by the typical cross-section or thickness greater than that shown on the plans will be paid at the contract unit price.

Payment will not be made for slabs deficient in thickness by one and one fourth (1-1/4) centimeters or more. Such pavements shall be removed and replaced by the contractor at his expense.

ITEM 404 - REINFORCING STEEL

All bars to be used shall be of the deformed type with minimum tensile strength of 40,000 psi. When placed in the work, it shall be free from dirt, detrimental rust, paint, oil, or other foreign materials. All steel reinforcements shall be accurately placed in the positions shown on the plans and firmly held during the placing and setting of concrete. Bars shall be tied at all intersections except where spacing is less than 0.30 meters in each direction when alternate intersections shall be tied.

Distance from the forms shall be maintained by means of stays, blocks, ties, hangers or other approved supports. Blocks for holding reinforcements from contact with the forms shall be precast mortar blocks of approved shape and dimensions or approved metal chairs. The use of pebbles, pieces of broken stones, metal pipes and wooden blocks shall not be permitted. Before the pouring of concrete, reinforcements shall be properly inspected first and checked as to conform with the plans and specifications. All reinforcements shall be furnished in full lengths indicated on the plans and splicing of bars, except when shown on the plans, will not be permitted, without the approval of the Engineer

Part – G - DRAINAGE AND SLOPE PROTECTION STRUCTURE

Lined Concrete Canal

Excavation and preparing earth foundation

Excavation for canal lining shall be as provided on the plan. Where the natural ground surface is below the elevation of the top of the canal lining shown on the drawings, the foundation for the concrete lining shall be compacted. The Contractor shall trim and finish the earth surfaces to provide a firm foundation for the concrete lining. If, at any point, the natural foundation material is disturbed or loosened during the excavation process or otherwise, it shall be consolidated in a manner satisfactory to the Engineer. If, at any point, material is excavated beyond the neat lines required to receive the concrete, the excess excavation shall be filled with selected material, moistened, if required, and compacted in a manner satisfactory to the Engineer. Immediately prior to placing concrete, the foundation shall be thoroughly moistened.

Placing Reinforcement

Reinforcement for canal linings shall be placed at 12 inches on center each way within the lining slab. Reinforcement placement shall conform to the specifications. In preparation for the placing of concrete, all water, construction debris and extraneous matter shall be removed from the canal section. The concrete shall be placed as nearly as possible to its final position by means that avoid segregation of the materials and displacement of the reinforcement.

Precautions and provisions shall be made to avoid plastic shrinkage cracking. When site and/or environmental conditions exist that have a high possibility for plastic shrinkage cracking, the Contractor shall follow these additional requirements:

Concrete shall not be placed in conditions where wind speed is or is anticipated to exceed 15 mph or if the combination of environmental and site conditions promote plastic shrinkage cracking.

At the discretion of the Engineer, concrete placement may be halted or postpone based on the current or forecasted weather conditions.

Delays in the concrete placement shall not relieve the Contractor from completing the project by the specified completion date stated in the Contract Documents.

A written proposal shall be submitted to the District Engineer for approval. The proposal will include the method of concrete placement, alternative mix designs, list of materials, additional finishers and laborers and equipment necessary to minimize the cracking.

Curing compound shall be applied to the surface immediately following the finishing operation and the entire surface covered with polyethylene sheeting.

Written approval does not relieve the Contractor of his or her responsibility nor accountability if plastic shrinkage cracking occurs.

No additional compensation will be made to the Contractor

Finishing Canal Lining

The finished surface of canal lining shall be equivalent in evenness, smoothness, and freedom from rock pockets and surface voids to that obtainable by the effective use of a long-handled steel trowel. Shallow surface pitting and trowel marks are not objectionable.

Deviations from true line and grade shall not exceed to specifications. There shall be no abrupt changes in section, line or grade.

Transverse grooves, three-quarter inch (3/4") deep and approximate one-half inch (1/2") wide, shall be made in the concrete lining. The first groove shall be made ten feet (10') from the end of the lined section and at ten-foot intervals throughout the full length of the lined section.

Curing Canal Lining

Concrete lining shall be cured by a white pigmented membrane curing compound.

Membrane curing shall be by application of a sealing compound conforming to ASTM C-309. Sealing compound shall be applied to the concrete surfaces by spraying in one coat to provide a continuous, uniform membrane over all areas.

The temperature of concrete as mixed and placed shall not be less than 55°F, nor greater than 90°F. If, during day or night, the ambient temperature falls below or is predicted to fall below 40°F, concrete shall be protected from freezing during placement and curing by means of heating of materials and other approved methods, as directed by the Engineer.

The concrete mix for cold weather placement shall be maintained at a minimum temperature of 55°F during placement and this minimum temperature shall be maintained for the first 72 hours of curing.

The maximum temperature of concrete as placed shall be less than 90°F. When the temperature of concrete as placed may be 90°F or higher, as may be reasonably predicted from current temperatures of materials and the likelihood of rises in weather temperatures, the Contractor shall employ effective means, such as precooling aggregates and mixing water, use of ice as part of the mixing water, shading aggregates, or placing at night, as necessary, to maintain the temperature of concrete, as placed, below 90°F.

Part – H – MISCELLANEOUS

Item 413 Pre-formed Joint Filler

Pre-formed joint fillers shall conform to the requirements as specified, and shall be punched to admit the dowels where called for on the Plans, The Joint filler shall be furnished in a single piece for the depth and width required for the joint unless otherwise specified by the Engineer. When use of more than one piece is authorized for a joint, the abutting ends shall be fastened securely and held accurately to shape, by using stapling or other positive fastening satisfactory to the Engineer.

600(3) Combination of Curb and gutter (cast in place)

Concrete Curb combination of Curb and gutter shall conform to the dimension, section on the approved Plan, In case of discrepancy actual site condition shall govern over drawing. Cement concrete shall be Class "A" as specified in Item 405, Structural Concrete. Excavation shall be made to the required depth and the base upon which the curb and/or gutter is to be set shall be compacted to firm and even surface. All soft and unsuitable material shall be removed and replace with suitable material.

Base course material shall be placed and compacted to form a bed of the required thickness as shown on the Plans.

Forms shall conform to the requirements of Item 407, Concrete Structures, Metal forms shall be of an approved section.

Forms for at least 50 m of curb and gutter shall be in-placed and checked for alignment and grade before concrete is placed. Curbs and gutters constructed on curves shall have forms of either wood or metal and they shall be accurately shaped to the curvature shown on the Plans. Mixing, placing and curing of concrete shall conform to the requirements of item 405, Structural Concrete.

Item 601 Concrete Sidewalk

Sidewalk shall conform to the dimension and thickness of the approved Plan. Cement concrete shall be Class "A" as specified in Item 405, Structural Concrete. The bed course shall be compacted earth material. The area to be paid for shall be the number of square meters of the sidewalk measured, completed in-place and accepted.

Item 606(2) - Reflectorized Thermoplastic Pavement Markings

Preparation of Road Surface

The materials should be applied only on the surface which is clean and dry. It shall not be laid into loose detritus, mud or similar extraneous matter, or over

an old paint marking, or over an old thermoplastic marking which is faulty. In the case of smooth, polished surface stones such as smooth concrete, old asphalt surfacing with smooth polished surface stones and/or where the method of application of the manufacturer of the thermoplastic materials shall be recommended shall be with the approval of the Engineer.

Preparation of Thermoplastic Materials

The materials shall be melted in accordance with the manufacturer's instruction in a heater fitted with a mechanical stirrer to give a smooth consistency to the thermoplastic and such the local overheating shall be avoided. The temperature of the mass shall be within the range specified by the manufacturer and shall on no account be allowed to exceed the maximum temperature stated by the manufacturer. The molten material shall be used as expeditiously as possible and for thermoplastics which have natural resin binders or otherwise sensitive to prolong heating the materials shall not be maintained in a molten condition for more than 4 hours.

Laying

Center lines, lane lines and edges shall be applied by approved mechanical means and shall be laid to regular alignment. Other markings may be applied by hand-screed, hand propelled machine or by self-propelled machine approved or directed by the Engineer. After transfer to the laying apparatus the materials shall be maintained within the temperature range specified by the manufacturer and stirred to maintain the right consistency for laying.

In the case of screen application the material shall be laid to a thickness of not less than 3mm (approx. 1/8 inch) or more than 6mm (1/4 inch) unless specifically authorized by the Engineer when laid over an existing marking. In the case of sprayed application the material shall be laid to the thickness of not less than 1.5 mm unless specifically authorized by the Engineer. In all cases the surface produced shall be uniform and appreciably free from bubbles and steaks. Where the Contractor Documents require or Engineer direct that ballotini shall be applied to the surface of the markings, these shall be applied uniformly to the surface of hot thermoplastic immediately after laying such that the quality of ballotini firmly embedded and retained in the surface after completion complies with the specifications.

Road markings of a repetitive nature, other center lines, lane lines, etc. shall unless otherwise directed by the Engineer be set out with stencils which comply with the size and spacing requirements shown on the Drawings.

Re-use of Thermoplastic Materials – At the end of the day as much as possible, the remaining material in the heater and/or laying apparatus shall be removed. This may be broken and use again provided that the maximum heating

temperature has not been exceeded and such re-using of material shall be approved by the Engineer.

Part – I –STREETLIGHTS

General

All works shall be done under the direct supervision of an Electrical Engineer and in strict accordance with these specifications and of the methods as prescribed by the latest edition of the Philippine Electrical Code.

All items not specifically mentioned in the specifications as noted on the drawing but which are obviously necessary to make a complete working installation shall be included.

Item 1100–3 Raceway/Underground Duct

This Item shall consist of the furnishing and installation of the complete conduit work consisting of electrical conduit. Conduit fittings such as couplings, locknuts and bushings and other electrical materials needed to complete the conduit roughing – in work of this project.

All materials shall be brand new and shall be of the approved type meeting all the requirements of the Philippine Electrical Code and bearing the Philippine Standard Agency (PSA) mark.

Rigid steel conduit shall be galvanized and shall conform to ANCI Standard C-80. Fittings of types approved by the Engineer shall be provided as required for connection to junction, pull and outlet boxes and to equipment.

UPVC. Plastic duct for concrete encased burial shall be PVC schedule 40 and shall conform to NEMA standards. Endbell fittings shall conform to NEMA standards.

No conduits shall be used in any system smaller than 12 mm diameter electrical trade size nor shall have more than four (4) 90-degree bends in any one run and where necessary, pull boxes shall be provided.

On exposed work, all pipes and outlet boxes shall be secured by means of galvanized metal clamps which shall be held in place by means of machine screws.

Item 1101(a) - Lighting Fixtures

All lighting fixtures and lamps are as specified and listed on lighting fixture schedule. Luminaire housing shall be die cast aluminium with electro gray finish for long life performance. It shall be pole mounted with wattage capacity from 200 watts to 400 watts High Pressure Sodium Lamps (HPS). Ballast shall be

220 volt with ignitor and capacitor and shall have universal two (2) bolt slip fitter and adjustable mogul or E40 socket. Standard construction is IP55 with breathing seal to prevent contaminant from entering the optical assembly. Ball latch shall be stainless steel and precision design refractor to uniformly laminate wide area.

Lamps.

Provide the type and wattage indicated in the drawing. High Pressure Sodium Lamps. 400-watts and to ANCI C78-1351 (26,000 lumens).

UL 1029 and ANSI C82.4, and shall be constant wattage transformer CWA or regulator, open type high power factor type. Ballast shall be designed to operate on the voltage system to which they are connected. Provide single lamp ballasts with a minimum starting temperature of minus 30 degrees Celcius (C). Ballast shall be constructed so that open circuit operation will not reduce their average life. High Pressure Sodium (HPS) ballast shall have a solid state ignitor/starter with an average life in the pulsing mode of 10,000 at an ignitor/starter case temperature of 75 degrees C. Average life is defined as the time after which 50 percent will have failed and 50 percent will have survived under normal conditions.

Item 1101 Wiring and Termination

Wires and cables shall be of the approved type meeting all the requirements of the Philippine Electrical Code and bearing the PSA mark. Unless specified or indicated otherwise, all power and lighting conductors shall be insulated for 600 volts. All wires shall be copper (unless otherwise specified as seen in the plan), soft drawn and annealed, smooth and of cylindrical form and shall be centrally located inside the insulation.

Conductors or wires shall not be drawn in conduits until after the cement plaster is dry and the conduits are thoroughly cleaned and free from dirt and moisture.

All joints, taps and splices on wires larger than 14 mm shall be made of suitable solderless connectors of the approved type and size. They shall be taped with rubber and PVC tapes providing insulation not less than that of the conductors.

Item 1102 –Power Supply

All materials shall be brand new and shall be of the approved type. It shall conform with the requirements of the Philippine Electrical Code and shall bear the Philippine Standard Agency (PSA) mark.

Lighting Contactor panel shall be designed and fabricated for pole mounting as indicated on the drawings. Enclosures shall be fabricated in accordance with NEMA-3R requirements and shall be watertight and dusttight, suitable for outdoor installation and shall be rated as specified in the drawings.

Enclosure shall be bolted cover with molded case circuit breakers, contactor and plug-in twist lock photo control unit and base.

The molded case circuit breakers shall be of the thermal-magnetic type having me tripping characteristic on overload and instantaneous trip on short circuits, shall be equipped with arc quenchers, shall have a quickmade and quick- break toggle mechanism, and shall have trip-free operating handles. Each multi-pole breaker shall have a common trip so that an overload on one pole with automatically cause all poles of the breakers to open. The circuit breakers shall have an interrupting rating of not less than 20,000 symmetrical amperes at 230 volts.

Lighting Contactor. NEMA ICS 2, electrically held contactor rated as indicated.

Provide as conforming to NEMA ICS 6. Contactor shall have silver alloy double-break contacts and coil clearing contacts and shall require no arcing contacts.

Provide contactor with hand-off-automatic selector switch. Contactor shall be hermetically sealed and shall be rated as specific in the drawings.

Photocell Switch.

A hermetically sealed cadmium sulphide cell rated 230 volts AC, 60 Hz with single throw contacts rated at 1800 VA, 230 volts, shall be provided conforming to UL-773. The switch shall be mounted in a high-impact resistant, non-corroding and non-conductive molded plastic housing with a NEMA locking type receptacle. The switch shall turn on 10.76 lux and off 32.28 lux. A time delay shall prevent accidental switching from transient light sources. A directional lens shall be mounted in front of the cell to prevent fixed light sources from creating a turn-off condition if necessary. The switch shall be aimed according to manufacturer's instructions. Normally the sensor opening shall be facing east.

Panelboards shall conform to the schedule of panelboard as shown on the approved plans with respect to supply characteristics, rating of main lugs or main circuit breaker, number and ratings and capacities of branch circuit breakers.

Panelboards shall consist of a factory completed dead front assembly mounted in an enclosing flush type cabinet consisting of code gauge galvanized sheet steel box with trim and door. Each door shall be provided with catch lock and two (2) keys. Panelboards shall be provided with directories and shall be printed to indicate load served by each circuit.

Panelboard cabinets and trims shall be suitable for the type of mounting shown on the approved plans. The inside and outside of panelboard cabinets and trims shall be factory painted with one rustproofing primer coat and two finish shop coats of pearl gray enamel paint.

All non-current carrying metallic parts like conduits, cabinets and equipment frames shall be properly grounded.

Item 1101(b) Street Lighting 35' Pole, 1 Arm

Poles

Provide steel poles designed for wind loading of 250 kilometers per hour determined in accordance with AASHTO LTS-2 while supporting luminaires having effective projected areas indicated. Poles shall be anchor-based types designed for use with underground supply conductors.

Provide hot-dipped, galvanized steel poles having minimum 3.5-mm thick steel, tapered 8 inches diameter base and 3 inches diameter at top and a height of 35 feet, with minimum yield/strength of 227 MPa and hot dipped galvanized finish inside and outside.

Provide anchor bases with hot-dipped, galvanized steel anchor bolts with double nut and washer, threaded at the top end and bend 90 degrees at the bottom end. Provide galvanized nuts, washer, and ornamental covers for anchor bolts. Galvanizing shall be in accordance with the requirements of ASTM A-120 for the poles and A-153 for the fittings.

Grounding

All roadway lighting poles, panel board and metallic boxes and electrically associated frame works shall be grounded effectively. Conductor and ground wires shall be insulated copper as shown and sizes as indicated in the plans. All connections shall be mechanically and electrically sound and secure by split type copper bolts and wire nuts of approved type. Grounding wire shall be made of stranded copper, soft drawn wire and shall be installed in one continuous length without splices or joint inside conduit. Ground rods shall be made of copper-clad steel and shall be driven in full length into the earth, sizes of which shall be indicated on the Plans' grounding details.