PART E

SURFACE COURSES

PART E - SURFACE COURSES

ITEM 300 AGGREGATE SURFACE COURSE

300.1 Description

This Item shall consist of a wearing or top course composed of gravel or crushed aggregate and filler material, whichever is called for in the Bill of Quantities, constructed on a prepared base in conformity with the lines, grades and typical cross-sections shown on the Drawings.

300.2 Material Requirements

Aggregate to be used under this Item shall be natural material, hard, durable particles or fragments of stone or gravel and sand or other fine mineral particles free from vegetable matter and lumps or balls that if compacted, it can readily form a firm and stable layer. When tested by AASHTO T11 and T27, the aggregate shall conform to the grading requirements tabulated hereunder:

Sieve Designation		Mass Percent Passing			
Standard mm	Alternate U.S. Standard	Grading A	Grading B	Grading C	Grading D
25	1"	100	100	100	100
9.5	3/8"	50-85	60-100	-	-
4.75	No. 4	35-65	50-85	55-100	70-100
2.00	No. 10	25-50	40-70	40-100	55-100
0.425	No. 40	15-30	25-45	20-50	30-70
0.075	No. 200	5-20	5-20	6-20	8-25

The coarse aggregate material retained on the 2.00 mm (No. 10) sieve shall have a mass percent of wear by the Los Angeles Test (AASHTO T96) of not more than 45.

When tested by AASHTO T89 and T90, the fraction passing the 0.425 mm (No. 40) sieve shall have a liquid limit not greater than 35 and a plasticity index ranging from 4 to 9.

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

300.3 Construction Requirements

300.3.4 Surface Course Thickness and Tolerances

Thickness of aggregate surface course shall be in accordance with the thickness shown on the Drawings. The allowable tolerances shall be as follows:

Permitted variation from design thickness of layer	+15mm - 5 mm
Permitted variation from design level of surface	+15mm - 5 mm
Permitted surface irregularity measured by	5mm
3-m straight edge	

Permitted variation from design crossfall or camber	÷0.2 %
Permitted variation from design longitudinal grade over 25 m in length	÷0.1 %

300.4 Method of Measurement

The quantity to be paid for shall be measured by the cubic meter of aggregate surface course including all fillers, compacted in-place, completed and accepted by the Engineer. No allowance will be given for material placed outside the design limits shown on the cross-sections.

300.5 Basis of Payment

The accepted quantity as provided in Section 300.4, Method of Measurement shall be paid for at the Contract unit price shown in the Bill of Quantities. The price and payment shall constitute full compensation for furnishing, handling, placing and spreading, watering and compacting all materials, including all labor and equipment, tools and incidentals necessary to complete the Item.

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
300 (1)	Gravel Surface Course	Cubic Meter

ITEM 302 BITUMINOUS TACK COAT

302.1 Description

This Item shall consist of preparing and treating an existing bituminous or cement concrete surface with bituminous material in accordance with the design Drawings. The work is the preparation for the construction of a bituminous surface course.

302.2 Material Requirements

Bituminous material shall be either Rapid Curing (RC) Cutback or Emulsified Asphalt or whatever is called for in the design drawings or in the Bill of Quantities and it shall conform to the requirements of Item 702, Bituminous Material.

302.3 Construction Requirements

302.3.1 Surface Condition

Tack coat shall be applied only to surface which are dry or slightly moist. No tack coat shall be applied when the weather is foggy or rainy.

Add these paragraphs for surface preparation:

Prior to the application of the tack coat by pressure distributor of not less than 1000 liters/day, loose materials shall be removed from the surface. Mechanical sweepers, blowers and hand brooms shall clean the surface until it is free from dust. On a soil surface or granular subbase, the clean surface shall be given a light application of water

and allowed to dry to a surface dry condition before bituminous material is applied. No traffic is permitted on the surface after it has been prepared to receive the spray coat.

302.3.2 Equipment

Equipment shall conform in all respects to Subsection 301.3.2 of the DPWH Standard Specifications for Highways, Bridges and Airports, 1995, Volume II.

302.3.3 Application of Bituminous Material

Modify this Subsection to read as follows:

Unless shown on the Drawings or otherwise specified the Contractor shall submit to the Engineer the details of the material selected for tack coat before commencing the work. The Engineer may require trials to confirm the product's suitability. Bitumen heating shall be by method that does not introduce free stream or moisture to the material. The rate of application of Emulsified Asphalt shall be within the range of 0.2 to 0.7 liter/m^2, the exact rate as determined by the Engineer.

The Contractor shall take extra care so that the application of bituminous material is not in excess of the specified amount. If there's any excess in the amount, it shall be blotted by sand or removed as directed by the Engineer. Hand spraying device shall be used to all areas inaccessible by the distributor.

302.4 Method of Measurement

Modify this Section as follows:

The bituminous tack coat shall be measured by the metric tonne placed, completed and accepted by the Engineer.

302.5 Basis of Payment

The accepted quantity prescribed in Section 302.4, Method of Measurement shall be paid for at the Contract unit price shown in the Bill of Quantities. The price and payment shall be full compensation for furnishing and placing material, surface preparation, spraying, and including all labor, equipment, tools and other incidentals necessary to complete the Item.

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
302 (1)	Bituminous Tack Coat	Metric Tonne

ITEM 310 BITUMINOUS CONCRETE SURFACE COURSE, HOT-LAID

Modify the whole text of this Item as follows:

310.1 Description

This Item shall consist of constructing a bituminous concrete surface course composed of aggregates, mineral filler, and bituminous material mixed in a central plant, constructed and laid hot on the prepared base in conformity with the lines, grades,

thickness and cross-sections shown on the design Drawings or established by the Engineer.

310.2 Material Requirements

The Contractor, at least three weeks prior to production, shall submit in writing a job-mix formula for each mixture supported by laboratory test data along with samples and sources of the components and viscosity-temperature relationships information to the Engineer for testing and approval. No substitution shall be made in the materials or mix without additional tests to show that the quality of bituminous concrete material is satisfactory.

310.2.1 Composition and Quality of Bituminous Mixture (Job-Mix Formula)

It shall be same as Subsection 307.2.1 of the DPWH Standard Specifications for Highways, Bridges and Airports, 1995, Volume II

310.2.2 Bituminous Material

It shall be either Medium Curing (MC) Cut-back Asphalt or Asphalt Cement, whichever is called for in the Bill of Quantities and shall conform to the requirements of Item 702, Bituminous Materials. The penetration grade, type and grade of bituminous material shall be as specified on the Drawings or by the Engineer.

310.2.3 Aggregates

Aggregates to be used shall conform to the requirements of Section 703.5, Aggregate for Bituminous Concrete of Item 703, Aggregates.

310.2.4 Mineral Filler

It shall conform to the requirements of Item 703A, Mineral Filler.

310.2.5 Hydrated Lime

It shall conform to the requirements of Item 701, Construction Lime.

Add this Sub-section to read as follows:

310.2.6 Material for Asphalt Mixture Wearing Course

Bituminous concrete material for asphalt mixture wearing course shall be the same as herein this specification. The required material for tack coat for this course shall be the same as those in Item 302, Bituminous Tack Coat having rate of application ranging from 0.20 to 0.70 liter per square mater. The exact rate shall be determined by the Engineer. The thickness of wearing course shall be in accordance with the design drawings.

310.4 Method of Measurement

a) The quantity to be measured and paid for bituminous concrete surface shall be the total net weight in metric tonnes of asphalt mixture provided as surface course, placed, compacted and accepted by the Engineer.

b) The quantity to be measured and paid for asphalt mixture wearing course shall be the total net area in square meter provided as wearing course, placed, compacted and accepted by the Engineer. The cost shall include the bituminous tack coat.

310.5 Basis of Payment

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
310 (1)	Bituminous Concrete Surface Course, Hot-Laid	Metric Tonne
310 (2)	Asphalt Mixture Wearing Course Including tack coat, (t = 50mm)	Square Meter

ITEM 311 PORTLAND CEMENT CONCRETE PAVEMENT

311.2 Material Requirements

311.2.11 Proportioning, Consistency and Strength of Concrete

Supplement the following to this Sub-section:

The Contractor shall submit design mixes obtained from samples made in accordance with Standard Method of Making and Curing Concrete Compression and Flexure Tests Specimen in the Laboratory for each strength required, stating the proposed slump and the proportioning weights of cement, saturated surface aggregates and water. These mixes shall be proven by preliminary tests thirty (30) days before concreting and shall show a 28-day strength of fifteen (15%) percent higher than the ultimate strength required. No substitution shall be made in the materials or mix without additional tests to show that the quality of concrete is satisfactory.

The proportion of aggregate to cement for concrete pavement shall be such that to produce a mixture which will work readily into the corners and around reinforcements, if any, with the method of placing concrete without permitting the materials to segregate or allow free water to collect on the surface. The combined aggregates shall be such compositions of sizes that when separated on the No.4 standard sieve, the weight passing the sieve (fine aggregate) shall not be less than thirty (30%) percent or greater than fifty (50%) percent of the total, except that these proportions do not necessarily apply to lightweight aggregates. The method of measuring concrete materials shall be such that the proportions can be accurately controlled and easily checked anytime during work.

Aggregates shall be measured preferably by weight and to within one (1%) percent. Water shall be measured by weight or volume to within one and one-half (1 1/2%) percent. The water shall in no case, exceed 23 liters per bag (40 kg) of cement for all concrete with specified minimum flexural strength of 550 psi when tested by the third-point method or 650 psi by the mid-point method and a compressive strength of 3,500 psi.

Job mix adjustment of water content shall be allowed only on permission of the Engineer, provided that cement is also added to keep the original water-cement ratio of the design mix.

311.3 Construction Requirements

311.3.1 Quality Control of Concrete

Add the following paragraph at the end of this Sub-section:

The Owner, his duly authorized representative or the Engineer shall have the right to order the test of any materials supplied by the Contractor entering into concrete pavement or reinforced concrete pavement whenever there is a reasonable doubt as to their suitability for the purpose. Such test shall be in accordance with the standards of the ASTM or AASHTO for testing materials noted elsewhere in the Specifications. Samples shall be provided by the Contractor without cost to the Owner. Expenses for testing and cost of transporting samples to the laboratory shall be borne by the Contractor. Copies or results of tests shall be furnished to the Owner promptly.

311.3.7 Mixing Concrete

Add the following to this Sub-section:

If mixing, transporting and depositing of concrete is done other than the procedure prescribed under this sub-clause is allowed by the Engineer, the Contractor shall remain to be solely responsible to observe and produce concrete with the same quality required in the Specifications.

No hand mixing shall be allowed during concreting operations except on emergency cases such as batching plant breakdown and shall stop at the first allowed construction joint. All concrete shall be machine mixed for at least 1½ minutes after all materials including water are in the mixing drum.

The batching plant shall be of an approved capacity and type which will insure a uniform distribution of materials throughout the mass. It shall be equipped with a device for accurately measuring and controlling the amount of mixing water in each batch. The first batch of concrete materials placed in the mixer shall contain a sufficient excess of cement, sand and water to coat the inside of the drum without reducing the cement concrete of the mix to be discharged.

311.3.9 Placing Concrete

Supplement this Sub-section with the following:

Concrete shall be deposited on its final position in such a manner to require minimal re-handling or flowing without segregation. Placing of concrete shall be preferably done by the use of buggies, buckets or wheelbarrows. Unless truck mixers or non-agitating hauling equipment are equipped with means to discharge concrete without segregation of the materials, the concrete shall be unloaded into an approved spreading device and mechanically spread on a grade in such manner as to prevent segregation.

No chutes will be allowed except to transfer concrete from hoppers to buggies, wheelbarrows or buckets on which case the chutes shall exceed six (6) meters in aggregate length. Placing of concrete with a free drop or fall of more than 1.5 meters shall not be allowed except when sheet metal conduits, pipes or elephant trunks are employed.

When stoppages of concreting operations eventually occur for any reason, construction joints shall be placed horizontally or as directed by the Engineer and be provided with shear keys and dowels to develop bond. Construction joints shall be approved by the Engineer

The Contractor shall provide forms that will produce the placed concrete in a correct and aligned manner. Plywood, metal or surfaced lumber forms shall be used for all exposed concrete surfaces. Plastering in general shall not be allowed so that extra care shall be exercised by the Contractor.

Forms and shoring shall not be removed until the concrete has adequately set and stable enough to withstand the anticipated loadings, and in no case less than two (2) days after concreting. Removal of forms may be allowed earlier provided that test samples of concrete are taken and are shown to withstand safely dead and construction loads.

311.3.18 Protection of Pavement

Modify this Sub-section with the following:

The contractor shall protect the pavement and its appurtenances both against public traffic and traffic caused by its own construction equipments. This shall include watchmen to direct traffic, the erection of and maintenance of warning signs, lights, pavement bridges or crossovers, etc.

Any damage to the pavement from the opening of traffic for public use until final acceptance shall be repaired or replaced by the contractor without additional compensation.

311.3.21 Opening to Traffic

Modify this Sub-section with the following:

The Engineer will decide the opening of pavement to traffic after test specimens molded and cured in accordance with AASHTO T23 have attained the minimum strength requirements in Subsection 311.2.11. If such tests are not conducted prior to the specified age, the pavement shall not be opened to traffic until fourteen (14) days after the concrete was placed. Before opening to traffic, the pavement shall be cleansed thoroughly and all joints shall be sealed completely.

311. 3.22 Tolerance and Pavement Thickness

Add the following to Sub-section 311.3.22 (2), Pavement Thickness:

Outside and inner shoulders of super elevation equal or greater than seven percent (7%) should be paved with 15 centimeters thick Portland Cement Concrete Pavement (PCCP) between P.C. and P.T. or as shown on the drawings.

311.4 Method of Measurement

Add at the end of the paragraph:

"All reinforcing steel bars incorporated in the concrete pavement shall not be measured separately for payment, cost of which has been considered paid under this particular Item.

Supplement the following to this Section:

The area to be paid for under this Item shall be the number of square meters of concrete pavement placed and accepted in accordance with the drawings measured from the outside edge of width to the other edge by the length horizontally measured along the center line of each roadway or ramp. Any curb and gutter placed shall not be included in the area of concrete pavement measured for payment.

Shoulder paved for a superelevation of more than 7.0 % shall be measured one (1) meter from the outside and innerside edge by the length horizontally measured along PC to PT.

311.5 Basis of Payment

The accepted quantity measured as specified in Sub-section 311.4, Method of Measurement shall be paid for at the contract unit price for Portland Cement Concrete Pavement, which price and payment shall constitute full compensation for preparation of roadbed and finishing of shoulders, unless otherwise provided by the Special Provisions, furnishing all materials, for mixing, placing, finishing and curing all concrete, for furnishing and placing all joint materials, for sawing weakened plane joints, for fitting the prefabricated center metal joint, for facilitating and controlling traffic, and for furnishing all labor, equipment, tools and incidentals necessary to complete the Item.

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
311 (1) a	PCC Pavement (Plain), t=280 mm	Square Meter
311 (1) b	PCC Pavement (Plain), t=250 mm	Square Meter
311 (1) c	PCC Pavement (Plain), t=230 mm	Square Meter
311 (2)	PCC Pavement (Reinforced, t=300 mm)	Square Meter

PART F

BRIDGE CONSTRUCTION

PART F - BRIDGE CONSTRUCTION

ITEM 400 PILING

All provisions of this Item in connection with Pre-cast Concrete Piles and Cast-in- place Concrete Bored Piles are modified as follows:

400.1 Description

400.1.1 Scope

This work shall consist of the furnishing, driving, and cutting-off of piles in accordance with these Specifications and in conformity with the Drawings and/or as designated by the Engineer. It also includes the construction of facilities for construction convenience, without which will either slow down the works or completely paralyze the operations relative to bridge construction.

400.1.2 Test Piles

Piles for pile driving tests which are shown on the Drawings shall conform to the requirements for piling as specified and designated by the Engineer. If ordered by the Engineer that driven test piles will not become part of the completed structure, test piles will be provided in addition to the permanent or regular piles. However, if so ordered by the Engineer to be part of the completed structure, test piles of the dimensions shown on the Drawings will be so correctly positioned, be properly driven to refusal or to such tip elevation or approximate bearing value as the Engineer may request. Test piles maybe cut-off at the elevation directed and approved by the Engineer. Piles driven by the Contractor for pile driving tests for his own use in determining the lengths of piles to be furnished maybe similarly located that they also maybe cut-off and become part of the completed structure provided that such test piles conform to the requirements for piling. Any driven pile, in which after serving the purpose as a test pile is found unsatisfactory for utilizations in structure, shall be removed if so ordered by the Engineer, or it shall be cut-off below the ground line and beams. Test piles shall generally be driven with the same equipment that is used for driving succeeding foundation piles.

In dynamic testing, when diesel hammers or other types of hammers are to be used for driving end bearing piles or friction piles, the bearing capacity shall be thoroughly checked by pile driving formula chosen by the Contractor and approved by the Engineer. The Contractor shall be in advance carry out test piling for calibration purposes so as to determine the energy developed by the hammer. The Contractor may elect one of the following methods for calibration.

a) By test driving piles of the same type successively with diesel hammer, or by driving two different piles with diesel hammer and gravity or single acting hammer according to detailed instructions given by the Engineer. The test shall be made at site with homogeneous soil conditions.

b) By driving test piles to a depth determined by the Engineer.

Calibration test shall be made at not less than two different sites until the results are satisfactory to the Engineer.

Calibration of diesel hammer may not be required if the hammer has been previously calibrated under similar soil conditions and for the same size and type of pile, provided that the calibration data is accepted by the Engineer.

Add the following to supplement this Sub-section:

400.1.2.1 Report

The report of the Test Pile shall include the following information:

A. General

1) Project identification
2) Project location
3) Test site location
4) Owner
5) Structural engineer
6) Geotechnical engineer
7) Pile contractor
8) Test boring contractor
9) Designation and location of nearest test boring with reference to location of the test pile and vertical control datum
10) Log of nearest test boring
11) Horizontal control datum
12) Vertical control datum

B. Pile Installation Equipment

1) Make, model, type, size, and recent service history of hammer
2) Weight of hammer and ram
3) Rated and actual stroke of ram
4) Rated energy of hammer
5) Rated capacity of boiler or compressor
6) Type, dimensions and stiffness values of cap-block and pile cushion
7) Weight and dimensions of drive cap
8) Detailed description and drawings of follower
9) Size of pre-drilling or jetting equipment
10) Type, size, length, weight and stress transmitting area of mandrel
11) Detailed specifications of any special arrangement for applying impact force.

C. Test Piles

1) Identification and location of test pile(s)
2) Working load of pile(s)
3) Type of pile(s)
4) Test pile material including basic specifications including strength
5) Tip and butt dimension of pile(s)
6) Date pre-cast test piles made
7) Concrete cylinder strengths when pile tested (approximate)
8) Description of internal reinforcement used in test pile (size, length, number of longitudinal bars, arrangement, spiral or tie steel)
9) Description, location, size, weight and where applicable catalogue data concerning splices

10) Condition of pre-cast piles including spalled areas, cracks, head surface and straightness of piles
11) Effective pre-stress
12) Which piles are vertical or batter
13) Degree of batter
14) Final elevation of test pile butt(s) referenced to fixed datum

D. Pile Installation

1) Date driven (installed)
2) Date concreted (cast-in place)
3) Volume of concrete or grout placed in pile
4) Grout pressure used
5) Description of pre-excavation or jetting (depth, size, pressure, duration)
6) Operating pressures for all hammers
7) Throttle setting-diesel hammer during testing
8) Fuel type diesel-hammer
9) Description of special installation procedures used such as piles cased off
10) Type and location of pile splices
11) Driving records
12) Final penetration resistance
13) Visual observations of stroke of ram during final driving and blow per drive of hammer
14) Penetration for last two series of five blows with the hammer
15) Penetration resistance during restrike
16) When cap-block replaced (indicate on log)
17) When pile cushion replaced (indicate on log)
18) Cause and duration of interruption in pile installation
19) Notation of every unusual occurrences during installation

E. Dynamic Testing

1) Description, calibration data and date of calibration of all components of the apparatus for obtaining dynamic measurements and apparatus for recording, reducing and displaying data
2) Data tested
3) Test pile identification
4) The modulus of elasticity, density, and wave speed of test pile and how it determined
5) Sequence in pile driving test, carried out such as end of initial driving and beginning of re-strike
6) Length of pile, as being driven, embedded, and below apparatus for obtaining dynamic measurements
7) Penetration resistance during dynamic testing
8) The range, average and standard deviation of the measurements of maximum and minimum compassion force
9) The range, average and standard deviation of the impact velocity data
10) The range, average and standard deviation of the measurements of maximum acceleration
11) The range, average and standard deviation of the measurements of final penetration of the pile
12) The range, average and standard deviation of the maximum and final energy data
13) Which one-dimensional wave theory was used for the analysis of the pile driving, give reference

14) The variables entered into the wave theory, such as damping, quake and resistance
15) When applicable, the computed soil resistance acting on the pile at time of testing and how it computed
16) Comments on the integrity of the pile

Data and force, velocity, acceleration, penetration and energy can be recorded at any point of interest during the pile driving. The standard deviation of these values should be calculated for a minimum of 20 consecutive hammer blows.

400.1.3 Static Load Test (For 1500mm Bored Piles)

A loading test shall consist of the application of a load equal to not less than twice the specified bearing capacity or as otherwise directed by the Engineer.

Test Procedure:

Static Load Tests shall be performed using procedures and equipment as set out in ASTM Specification D1143 – quick load test method. A load cell shall be utilized for all static tests – jack pressure alone is not sufficient. The requirements of ASTM D1143 shall take precedence over any conflicting requirements contained in the remainder of this clause, either in the Standard Specifications or the Special Provisions. The allowable pile capacity shall be assessed based on Davison's Failure Criterion with a factor of safety F.S. = 2.0. The maximum load to be applied during the test shall be two (2) times the specified allowable bearing capacity.

The Contractor shall submit to the Engineer detailed Drawings of the loading system and apparatus he intends to use at least 3 weeks in advance of the tests. The apparatus shall be so constructed as to allow the various increments of the load to be placed gradually without causing vibration to the test piles.

Suitable approved apparatus to determine the accurate loading on the pile and the settlement of the pile under each increment of load shall be supplied by the Contractor. The apparatus shall have a working capacity of three times the designed load for the pile being tested.

All pile load settlements shall be measured by adequate and accurate devices, such as gauge and shall be checked by means of an Engineer's level. Increments of deflection shall be read and recorded just after each load increment is applied and at 15 minute intervals thereafter. The safe allowable load shall be considered as 50 percent of the load applied, which after 48 hours of continuous application has caused not more than 6 mm of permanent settlement measured at the top of the pile.

The first load to be applied to the test pile shall be 60% of the pile designed load and first increment shall be up to the pile designed load. The load on the pile shall be increased to twice the designed load by applying additional loads in three equal increments. A minimum period of two (2) hours shall intervene between the applications of each increment, except that no increment shall be added until a settlement of less *than 0.1 mm is observed for a 15-minute interval under the previously applied increment.* If there is doubt as to whether the test pile will support the test load, the load increments shall be reduced by 50 percent, at the discretion of the Engineer, in order that a more closely controlled failure curve may be plotted. The full test load shall remain on the test pile not less than 48 hours. The full test load shall then be removed and the permanent settlement shall be read and recorded.

When directed by the Engineer, load test shall then be continued beyond the double designed load in 10-ton of increments to failure or a maximum of 3 times the designed load.

The pile maybe considered failure when the total permanent settlement exceeds 6 mm.

400.2 Material Requirements

400.2.3 Concrete Piles

400.2.3.1 Pre-cast Concrete Piles

Pre-cast Concrete Piles shall be 450mm x 450mm with structural steel V-shape pile tip as shown on the drawings. Concrete Class AA and reinforcing steel for piles shall meet all the requirements as provided under Item 405, Structural Concrete and Item 404, Reinforcing Steel respectively or as indicated on the Drawings.

400.2.3.2 Cast-in- place Concrete Bored Piles

Concrete for cast-in-place bored piles shall be Class AA1 with minimum compressive strength of 28 MPa as prescribed in Item 405, Structural Concrete. The maximum size of aggregate shall not exceed 25 mm. Bored pile ranges from 1200 mm to 1500 mm diameter as shown on the Drawings.

Reinforcing steel bars shall conform to the requirements of Item 404, Reinforcing Steel.

400.2.4 Steel Shells

Shells or steel casing for cast-in-place concrete bored piles, unless otherwise called for on the Drawings, shall have a minimum thickness of 5 mm conforming to AASHTO M 183.

400.2.5 Steel Pipes

Steel pipes which are being filled with concrete shall conform to the requirements of ASTM A 252, Grade 2, Welded and Seamless Pipe Piles. Closure plates for closed piles shall conform to the requirements of AASHTO M 183.

400.3 Construction Requirements

400.3.1 Location and Site Preparation

Piles shall be used where indicated on the Drawings or as directed by the Engineer. All excavations for the foundations on which piles are to be driven shall be completed before the driving is began, unless otherwise specified or approved by the Engineer. After driving is completed, all loose and displaced materials shall be removed from around the piles by hand excavation, leaving clean solid surface to receive the concrete coping of the foundations.

400.3.2 Determination of Pile Lengths

The criteria for pile length and bearing capacity will be determined by the Engineer according to the results from test piling. The pile shall be driven to such depths, that the

bearing load indicated on the Drawings are obtained. The criterion for pile length maybe one of the following:

a) Piles in sand and gravel shall be driven to a bearing value determined by the use of the pile driving formula or as decided by the Engineer.

b) Piles in clay shall be driven to the depths ordered by the Engineer. However, the bearing value shall be controlled by the pile driving formula if called for by the Engineer.

c) Piles shall be driven to refusal on rock or hard layer when so ordered by the Engineer.

The Contractor shall be responsible for obtaining the correct pile lengths and bearing capacities according to the criterion or criteria given by the Engineer.

400.3.3 Pile Driving

All piles shall be driven accurately to its vertical or to its batter position as shown on the drawings. All piles shall, after driving, be within 150 mm from the theoretical location underneath the pile cap or underneath the superstructure in the case of pile bents. All piles pushed up by the driving of adjacent piles or by any other cause shall be re-driven.

Piles shall be used in places where a recommended penetration of three (3) meters in firm materials is obtained or unless otherwise ordered by the Engineer. Where a soft upper stratum overlies a hard stratum, the piles shall penetrate the hard material a sufficient depth to fix the ends rigidly. The recommended penetration of three (3) meters shall be subject to change depending on the results of the pile test.

All pile driving equipment is subject to the Engineer's approval. The Contractor is responsible for sufficient weight and efficiency of the hammers to drive the piles down to the required depth and bearing capacity. Hammers shall be gravity hammers, single and double acting steam or pneumatic hammers or diesel hammers. Gravity hammers shall not weigh less than 60 % of the combined weight of the pile and driving head but not less than 2,500 kg. The fall shall be adjusted so as to avoid injury to the pile. The plant and equipment furnished for steam hammers shall have sufficient capacity to maintain, under working conditions, the pressure at the hammer specified by the manufacturer. The boiler or pressure tank shall be equipped with an accurate pressure gauge and other gauge shall be supplied at the hammer intake to determine the drop in pressure between the gauges. When diesel hammers are used, they shall be calibrated with test piling in accordance with pile driving test specified in Sub-item 400.1.2.

Water jets shall be used only when permitted in writing by the Engineer. When water jets are used, the number of jets and the nozzle volume and pressure shall be sufficient to erode freely the material adjacent to the pile. The jets shall be shut off at a depth not less than three (3) meters before final tip elevation is reached, and the piles shall be driven solely by hammer to final penetration as required by the Engineer.

Piles shall be supported in line and position with leads while being driven. Pile driving leads shall be constructed in such a manner as to afford freedom of movement of the hammer, and shall be held in position by guys or steel braces to insure rigid lateral support to the pile during driving. The leads shall be of sufficient length to make the use of a follower unnecessary, and shall be so designed as to permit proper placing of batter

piles, if required. The driving of piles with followers shall be avoided if practicable and shall be done only under written permission from the Engineer.

The method used in driving piles shall not subject them to excessive and undue abuse producing crushing and spalling of the concrete, injurious splitting, and splintering. Manipulation of piles to force them into proper position, if considered by the Engineer to be excessive, will not be permitted.

The pile tops shall be protected by driving heads, caps, or cushions in accordance with the recommendations of the manufacturer of the hammer and to the satisfaction of the Engineer. The driving head shall be provided to maintain the axis of the pile in line with the axis of the hammer and provide a driving surface normal to the pile.

Piles shall be driven to refusal in rock or hard material when directed by the Engineer. Practical refusal shall be considered attained when the blow count is 6 for the last 10 mm of driving as determined by the Engineer.

400.3.6 Pre-cast Concrete Piles

Pre-cast piles shall be made in accordance with the designed drawings and the reinforcements shall be placed accurately and shall be secured rigidly in such manner as to insure its proper location in the completed pile. The concrete cover as measured to the outside face of ties shall not be less than 100 mm unless otherwise shown on the drawings.

The piles shall be casted separately, and if alternate piles are casted in a tier, the intermediate piles shall not be casted until 4 days after the adjacent piles have been poured. Piles casted in tiers shall be separated by tar paper or other suitable separating materials. The concrete in each pile shall be placed continuously. The completed piles shall be free from stone pockets, porous spots or other defects and shall be straight and true to the form specified. A 20 mm chamfer strip shall be formed on all corners. Form shall be mortar tight. Piles shall be cured in accordance with the requirements of Item 405, Structural Concrete.

Piles shall not be moved until the test indicates a compressive strength of 80 percent (80%) of the designed 28-day compressive strength and they shall not be driven until the tests indicate such compressive strength. Pile tips shall be of the design as called for on the Drawings or as directed by the Engineer.

400.3.7 Cast-In-Place Concrete Piles

Bored Piles

All provisions of this Section shall apply except where modified by procedures to conform to the prevailing practice in connection with the "Bored Piles" Method. Regardless of the procedure adopted, the construction of the bored piles shall be in strict conformity with the drawings.

All holes for cast-in-place bored piles shall be drilled up to the tip elevation as shown on the design Drawings.

Bored piles shall be of the type and sizes shown on the drawings and shall be in accordance with Item 400.2.3 herein this Specification. They shall not be changed or modified without the instruction or approval from the Engineer.

Reinforcing steel works shall conform to the requirements of Item 404, Reinforcing Steel.

Structural steel casing shall conform to the provision of Section 400.3.7(2) of the DPWH Standard Specifications unless otherwise shown on the drawings. Unless otherwise specified on the Drawings or directed by the Engineer, steel casing shall be driven to not less than 4 meters from the original ground surface.

The type of Slurry to be used shall be either "Bentonite" or "Supermud" or approved equivalent. The percentage and specific gravity of the material shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement. The level of the slurry shall be maintained at a height sufficient to prevent caving of the hole.

Prior to the execution of the works, the Contractor shall submit complete detailed methodology statements describing the procedure on how he intends to prosecute the various stages of his operations from the preparatory works up to completion stating among others, the required equipment, materials and the sequence of all activities.

Records and as-Built Drawings

Make complete boring record of each hole, upon completion of boring operation. The Contractor shall submit As-Built Drawings as may be required by the Engineer which accurately record the date, size, depth, location of all bored holes and local conditions encountered during the execution of the work.

The Contractor, when engaging the services of a Subcontractor, the latter shall have the complete outfit in terms of equipment and experienced qualified personnel, all subject to the approval of the Engineer who shall evaluate the same. The Subcontractor shall be qualified in all aspects as to his legal, technical and financial standings before he is considered for this specialized job. Nevertheless, the Contractor shall remain fully responsible and liable for the works and other acts of his Subcontractor in connection with the subcontracted works.

400.3.11 Cutting of Piles

Modify the second paragraph with the following:

Concrete piles shall, when approved by the Engineer, be cut off at such a level that at least 150mm of undamaged pile can be embedded in the structure or as shown on the drawings. If a pile is damaged below this level, the Contractor shall repair the pile to the satisfaction of the Engineer. The longitudinal reinforcement of the piles shall be embedded in the structure to a length equal to at least 40 times the diameter of the main reinforcing bars or as shown on the drawings. The distance from the side of any pile to the nearest edge of the cap shall not be less than 200 mm.

400.3.12 Defective Piles

Modify this Sub-section with the following:

Any pile delivered with defects or damaged during driving or placed out of its proper location or driven below the elevation fixed by the Drawings or by the Engineer, shall be corrected at the Contractor's expense by one of the following methods approved by the Engineer for the pile in question:

a) The pile shall be withdrawn and replaced by a new and, when necessary, a longer pile.

b) A second pile shall be driven or cast adjacent to the defective pile.

400.3.16 Pile Records

Modify this Sub-section with the following:

The Contractor shall keep records of all piles driven or installed. A copy of the record shall be given to the Engineer within two (2) days after each pile is driven. The record form to be used shall be approved by the Engineer. The pile records shall give full information on the following:

Driven Piles:

1. Pile type and dimension
2. Date of casting and date of driving
3. Driving equipment: type, weight and efficiency of hammer, etc.
4. Depth driven and tip elevation.
5. Final set for the last 20 blows
6. For gravity and single-acting hammer: height of drop
7. For double-acting hammers: the frequency of blows
8. Details of any interruption in driving
9. Level of pile top immediately after driving and the level when all piles in the group are driven.
10. Details of re-driving.
11. Cut-off elevation and actual length of each pile section.

Add herein these two (2) Sub-sections to read as follows:

400.3.17 Granular Fill

After all foundation piles have been driven, cut-off to its desired top elevation, and have all necessary encasements, the designed elevation of the bottom of footing has been trimmed, excavated, filled and compacted, and made level. Placing of granular fill as bedding will be provided with the required thickness as shown on the drawings or as directed by the Engineer.

400.3.18 Lean Concrete

Upon completion of granular fill, lean concreting if required will be executed to the desired thickness shown on the Drawings or as directed by the Engineer. However, it is necessary to check the actual elevation of the pouring guide prior to the commencement of concreting to avoid any possible mistakes.

400.4 Method of Measurement

1) Piles Furnished

The quantity to be paid for will be the sum of the lengths in meters of the piles of each type and size furnished and delivered to site and accepted by the Engineer. This will include all extensions that maybe necessary but excluding additional piles or test piles

driven that maybe necessary to suit the Contractor's Method of Construction and were driven at his option.

Furnishing Length:

a) The quantity to be paid for the furnishing of Regular Pile will be the total length in meters of the pile driven as regular pile required in the design drawings plus an allowance of 1.25 meters inclusive of the least embedment to the structure.

b) The quantity to be paid for the furnishing of Test Pile will be the total length in meters of the pile driven as test pile required in the design drawings plus 1.25 meters chip-off portion plus an allowance of 2 meters.

2) Test Piles

The quantity to be paid for Test Piles will be measured by the total length in meters of the piles furnished and driven as test piles required in the design drawings inclusive of 1.25 meters chip-off portion and an allowance of 2 meters.

3) Piles Driven

The quantity to be paid for will be the sum of the lengths in meters of the piles of each type and size driven in the completed work and measured from the pile tip elevation to the bottom of pile caps, footings or bottom of concrete superstructure in the case of pile bents, and shall be accepted by the Engineer. This will not include additional piles or test piles driven that maybe necessary to suit the Contractor's Method of Construction and were driven at his option.

Unless otherwise provided for, pre-boring, jetting or other methods used to facilitate pile driving operations will not be measured directly but will be considered subsidiary to the pay items for which they were performed.

4) Cast-in-Place Concrete Piles

The quantity to be paid for will be the sum of actual lengths in meters of the piles cast and left-in place, completed and accepted by the Engineer. Lengths will be measured from the pile tip elevation to the bottom of cap or footing. Portions of piles cast deeper than the required due to over drilling shall not be measured for payment.

5) Pile Shoes

The quantity to be paid for pile shoes, including test pile shoes will be measured and paid for in the total number of pile shoes driven as shown on the Drawings. Pile shoes damaged or lost and replaced by the Contractor shall not be measured for payment. Pile shoes furnished by the Contractor at his own option and different from the required shall not be measured for payment.

6) Load Test

The quantity of load test to be paid for will be the number of tests completed and accepted by the Engineer. Load test made by the contractor to calibrate different types of hammers than the required will not be measured for payment.

400.5 Basis of Payment

The accepted quantities, measured as prescribed in Item 400.4, Method of Measurement shall be paid for at the Contract unit price for each of the particular items that are listed below and included in the Bill of Quantities, which price and payment shall be full compensation for furnishing and placing all materials, including all labor, equipment tools and incidentals necessary to complete the work prescribed in these Item.

Pay Item No.	Description	Unit of Measurement
400 (4) b	Precast Concrete Piles (450 mm x 450 mm), Furnished	Linear Meter
400 (13) b	Precast Concrete Piles (450 mm x 450 mm), Driven	Linear Meter
400 (15) b	Test Piles, (450 mm x 450 mm) Furnished and Driven	Linear Meter
400 (16) a	Concrete Piles Cast-in Drilled Holes, (1000 mm diameter)	Linear Meter
400 (16) b	Concrete Piles Cast-in Drilled Holes, (1200 mm diameter)	Linear Meter
400 (16) c	Concrete Piles Cast-in Drilled Holes, (1500 mm diameter)	Linear Meter
400 (19) b	Pile Shoes for 450 mm x 450 mm Piles	Each
400 (21)	Static Pile Load Test (for 1500 mm dia. Bored Pile)	Each

SPL ITEM 400 (23) a HIGH-STRAIN DYNAMIC TESTING

SPL 400 (23) a.1 Description

High-Strain Dynamic Testing is performed by obtaining and analyzing records of shaft force and velocity under weight impacts for evaluation of shaft load carrying capacity, structural integrity, and load movement and shaft-soil load transfer relationships.

Testing of drilled and cast-in-place shafts closely resembles in testing of driven piles during re-strike. The following are specifications and instructions for high-strain dynamic testing of drilled and cast-in-place foundation shafts.

The work shall consist of furnishing all materials, equipment and labor necessary for conducting high-strain dynamic tests on drilled and cast-in-place shafts (hereinafter each noted as test shaft). The Contractor will not be responsible for conducting the test, but he will be required to supply materials, equipment and labor as hereinafter specified and he is also responsible for the results of the test. High Strain Dynamic Testing is a non-destructive quick test and it is intended that the test shaft be left in a condition suitable for use in production. Unless otherwise specified, testing procedures shall conform to the ASTM D 4945-89 specification. The shaft used for the test will be instrumented and tested by others, as approved by the Engineer, meeting the requirements outlined in the ASTM D 4945-89 specification as well as those outlined below.

SPL 400 (23) a.2 Equipment and Materials Requirements

The contractor shall supply all labor, materials and equipment required to prepare the test shaft, dynamically load the shaft, and returns the shaft to a condition suitable for

use in the finished structure. Equipment required to perform the test includes but is not limited to:

(a) If a permanent casing is not used as a feature to conduct the shaft, then a shaft top extension, consisting of a thin walled casing or equivalent shall be used to extent the shaft by length equal to two and a half (2-1/2) pile diameters. This top length, defined as the "test area" must be exposed and readily accessible by the testing Engineer at this time of the test. If the shaft top is below grade, then the contractor must have equipment available to remove surrounding soil (creating a safe working environment) so as to completely expose a test area of the shaft as described above. Windows on possible sides of the shaft may have to be cut off in the steel casing to reach the concrete.

(b) Means to ensure flat, level (axial to shaft) and soil concrete shaft top. Concrete should be on level with or above the casing.

(c) A drop weight in the range of one and half to two percent (1.5 – 2%) of the anticipated pile capacity, or as determined by the Engineer.

(d) A guide allowing variable drop heights typically between 2 to 3 m, or as determined by the Engineer.

(e) A shaft top cushion consisting of new sheets of plywood with total thickness between 2 to 6 inches (50 to 150 mm), or as determined by the Engineer.

(f) A steel striker plate with a thickness of at least 2 inches (50 mm) and an area between 70 to 90% of shaft top area but not less than the area of the impacting surface of the drop weight to be placed on top of the plywood cushion.

(g) If protruding reinforcing bars are present, the Contractor has the option to incorporate the reinforcing steel in the test area. Upon successful completion of the dynamic test, the surrounding concrete can then be removed as to make the pile suitable for use in the structure. If the Contractor selects not to incorporate the steel in such a manner as described above, then a steel beam or pipe (cross sectional area approximately 20% of the shaft cross sectional area) shall be supplied with sufficient length such that the ram impact will not interfere with the reinforcing bars. Steel striker plates and plywood cushion must also be sized so that they cover as much of the impact area as possible.

(h) One (1) kW of 200 Volt AC power.

(i) Surveyor's transit, laser light or equivalent for measurement of pile set under each impact.

SPL 400 (23) a.3 Dynamic Testing Firm

Testing is to be performed by an accredited Independent testing specialist from a firm with a minimum of four (4) years experience in dynamic load testing. The actual test shall be conducted and/or supervised by a Practicing Geotechnical Engineer with at least five (5) years of dynamic testing or who achieved basic level or better on the Foundation QA Examination for Providers of PDA Testing Services. Selection of the firm must be acceptable to the Engineer.

The independent dynamic testing firm must apply the following testing instrumentation in addition to that outlined in ASTM Specification D 4945-89 Section 5:

(a) Pile Driving Analyzer (PDA)
(b) Calibrated Strain Transducers
(c) Calibrated Accelerometers

Prior to performing the dynamic test, the testing Engineer must be provided with soil borings, shaft installation records, concrete properties (strength, etc.) and details regarding the anticipated dynamic loading equipment. The test Engineer is required to perform wave equation analyses (using GRLWEAP or equivalent) to determine the suitability of the proposed dynamic loading equipment and an acceptable range of ram drop heights so as not to cause damage in the shaft during the test.

SPL 400 (23) a.4 Construction Requirements

(a) The test shaft shall be constructed using the approved installation techniques.

(b) If a permanent casing is not required, then the upper length equal to two shaft diameters, noted as the "test area", must be cased in a thin wall tube or equivalent as noted above. Casing of this test area must be made as a continuation of the construction of the shaft. There should not be soil contamination or non-uniformities in the concrete located within or below the test area. Shaft top shall be made level to the casing and smoothed.

(c) Prior to testing time, the Contractor shall make the shaft test area length completely accessible to the testing Engineer.

(d) Prior to the test, four "windows" with an approximate size of 6 by 6 inches (150 by 150 mm) diameter opposite with each other will be located and removed from the casing if appropriate.

(e) In cases where casing is not present, the testing shall be smooth (by grinding) areas around the pile circumference such that proper gage attachment can be accomplished.

(f) Gages shall be attached by the testing Engineer to the exposed concrete or steel casing in a secure manner as to prevent slippage under impact.

(g) Shaft top should be examined to insure concrete is flushed with or above the casing.

(h) Apply plywood cushion and then striker plate to the shaft top. If reinforcing protrudes from the shaft top, it should be secured in such a manner as not to move under impact.

(i) At least two (2) hammer impacts should be applied to the pile top. First drop height should be minimal to allow the testing Engineer to assess the testing equipment, the driving system and pile stresses. Subsequent impacts can then be applied by utilizing higher drop heights.

(j) Upon completion of the test, it is the Contractor's responsibility to return the pile to acceptable production condition.

SPL 400 (23) a.5 Reporting of Results

It is the Testing Engineer's responsibility to submit a timely report of the testing results. In addition to the field results from at least one (1) CAPWAP analysis (Case Pile Wave Analysis Program) shall be submitted. CAPWAP analysis shall be performed by an Engineer that has achieved Advanced Level or better on the Foundation QA Examination for Providers of PDA Testing Services. The report must also provide the following:

(a) Wave Equation Analysis results obtained prior to testing.

(b) CAPWAP analysis result

(c) For each impact, the maximum measured force, maximum calculated tension force, transferred energy to the gage location, corresponding stresses, and the Case Method bearing capacity.

(d) Assessment of the test results both with respect to pile capacity and integrity.

SPL 400 (23) a.6 Method of Measurement

The quantity of designated size of piles on which high strain dynamic pile tests were carried out shall be measured and paid for in its total numbers inclusive of mobilization and demobilization of equipment, calibration, testing, recording, analyzing, and reporting.

SPL 400 (23) a.7 Basis of Payment

The quantities determined as provided under Section SPL 400 (23) a.6, Method of Measurement shall constitute full compensation for the cost of Pile Dynamic Testing, including tools and incidentals necessary to complete the work prescribed in this Item.

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
SPL 400 (23) a	High Strain Dynamic Pile Test For 1000 mm Bored Piles	Each
SPL 400 (23) b	High Strain Dynamic Pile Test For 1200 mm Bored Piles	Each

SPL ITEM 400 (24) PILE INTEGRITY TEST

SPL 400 (24).1 Description

This Item shall consist of providing equipment and qualified personnel to conduct pile integrity tests to determine non-uniformities on cast-in-place piles, preparation of reports and recommendations, all as required in accordance with the Specification of ASTM 5882 (Integrity Testing Method).

SPL 400 (24).2 Execution of the Works

Pile Integrity Testing shall be performed only on piles designated by the Engineer.

The contractor shall hire/engage only services of Subcontractor qualified to perform the required job. The contractor shall inform the Engineer in writing the nominated subcontractor/s he proposes to hire including company profile and related job experience.

Nominated subcontractor shall have vast knowledge and experience with the type of test required and shall have appropriate equipment to perform the test. The method of test shall either be of the following method.

(a) Low Strain Pulse Echo Method

(b) Transient Response Method

The Contractor or his subcontractor shall be responsible for the preparation of pile surface prior to proceeding with the test to ensure reliable result. Contaminated concrete surface shall be chipped-off and cleaned of bentonite slurry, mud or other foreign materials before attaching the equipment.

The method and/or procedure in the conduct of testing shall be in accordance with the requirements of the type of test employed.

Report shall be prepared on every pile tested and any recommendations and/or measures to be taken shall be discussed in details.

SPL 400 (24).3 Method of Measurement

The quantity to be measured and paid for shall be the number of piles tested, completed and tested and accepted by the Engineer.

SPL 400 (24).4 Basis of Payment

The quantities determined as provided under Section SPL 412 (2).3, Method of Measurement shall be paid for at the Contract unit price of the test completed and accepted on each pile, which price and payment shall be full compensation for the provision of equipment, conduct of test required, preparation of reports, for all labor, tools and incidentals necessary to complete the Item.

Payment shall be made only to those piles tested and reports submitted to the Engineer.

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
SPL 400 (24)	Pile Integrity Test for Bored Piles (For Bored Piles, Various Diameter)	Each

ITEM 401 RAILINGS

Modify this Item to read as follows:

401.1 Description

This Item shall consist of furnishing or fabricating and/or placing railings for bridges, and other structures, of concrete or steel materials or combination of the two materials

according to its type as shown on the Drawings. Railings shall be constructed in conformity with the lines, grades and dimensions shown on the Drawings.

401.2 Material Requirements

All concrete materials to be used shall be Class C in accordance with the requirements of Item 405, Structural Concrete.

Reinforcing steel shall conform to the requirements of Item 710, Reinforcing Steel and Wire Rope.

Steel materials consisting of steel and iron plates, shapes, pipes and fittings and castings shall be in accordance with the requirements of Item 403, Metal Structures.

Paint materials shall conform to the requirements of Item 709, Paints.

401.4 Method of Measurement

The quantity to be paid for shall be the total net lengths of railings in linear meters measured from center to center of end posts according to its type, completely constructed and accepted by the Engineer.

401.5 Basis of Payment

The accepted quantity measured as provided in Section 401.4, Method of Measurement shall be paid for at the Contract unit price shown in the Bill of Quantities, which price and payment shall be full compensation for furnishing and placing materials, painting the erected railings, and it includes all labor, equipment, tools and incidentals necessary to complete the Item.

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
401 (1)	Concrete Railing Type A (Concrete Post and Precast Beams)	Linear Meter
401 (2) a	Steel Railing Type A	Linear Meter

SPL ITEM 401 (3) a BRIDGE NAME PLATE

SPL 401 (3) a.1 Description

The Item shall consist of providing name plate on the bridge and shall include the furnishing of materials, labor and equipment required to supply, construct or install, or to complete all the works as shown on the Drawings and as approved by the Engineer.

The wording and text for the bridge and monument name plates shall be submitted by shop drawing noting in full scale the wording and phrasing to be used. The Engineer, prior to plate fabrication, shall approve the submitted Drawing.

The following information shall at least be emerged on the plaque:

- Name of the bridge,

- Completion date,
- Name of client, contractors, and consultants
- Bridge features, and
- JBIC Loan No.

SPL 401 (3) a.2 Material Requirements

Name plates of 1000mm x 600mm shall be from brass plates meeting the requirements of ASTM B36 with welded mold steel anchor bolt, wall, foundation and wording as directed by the Engineer. Prior to the installation of name plaque, the Contractor shall propose construction details to the Engineer for approval.

The wall and foundations of the monuments shall be of class C concrete in accordance with the requirements of Item 405, Structural Concrete.

Reinforcements shall be in accordance with the requirements of Item 404, Reinforcing Steel.

SPL 401 (3) a.3 *Construction Requirements*

The Contractor shall furnish the name plate and install 2 sets on the bridge as directed by the Engineer.

Concrete and reinforcement works shall follow the requirements prescribed in Item 405, Structural Concrete and Item 404, Reinforcing Steel respectively.

SPL 401 (3) a.4 Method of Measurement

Bridge Name Plates shall be measured for payment based on the number of plates installed in accordance with the requirements shown on the Drawings and approve by the Engineer.

Payment for bridge plate includes all the requirements such as plate, wall, and foundation; furnishing all materials, labor, equipment and incidentals necessary to complete the work. The payment includes cost for materials such as re-bar, concrete, pavement, excavation, backfill, grading, asphalt pavements, etc. to complete the work.

SPL 401 (3) a.5 Basis of Payment

The accepted quantity as provided in Section SPL 416.4, Method of Measurement shall be full compensation for furnishing all materials and for all preparation, erection, surface treatment (galvanizing and painting) and installation of these materials, and for all shop drawings, labor equipment, tools, and incidentals to complete the Item.

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
SPL 401 (3) a	Bridge Name Plate, 1000mm x 600mm	Each

ITEM 404 REINFORCING STEEL

404.3 Construction Requirements

Add herein this specification the following:

404.3.7 Rebar Fabrication and Installation

Rebar fabrication and installation shall be done by a competent steelmen to ensure good workmanship. There should be a proper supervision for the "cutting and bending" of reinforcing bars, frequent checking of bar schedule and clearances, from the beginning until or up to where the re-bars are to be installed. Thus, covering shall always be confirmed also to the designed drawings.

404.3.8 Bar bending, Splicing and Placing

The Contractor shall submit to the Engineer for approval, the shop Drawings indicating the bending, cutting, splicing and installation of all reinforcing bars.

Bars shall be bent cold. Bars partially embedded in concrete shall not be field bent unless permitted by the Engineer.

Bar splicing not indicated on the Drawings shall be subject to the approval by the Engineer.

Welded splices, if approved by the Engineer shall develop in tension at least 125% of the specified yield strength of the bars.

Not more than 50% of the bars at any section shall be spliced.

Unless otherwise shown on the Drawings, the clear distance between parallel bars in a layer shall not be less than 1.5 times the nominal diameter of the bar nor less than 1.5 times the maximum size of the coarse. The clear distance between layers shall not be less than 25 mm nor one bar diameter. The bars in the upper layer shall be placed directly above those in the bottom layer.

404.4 Method of Measurement

Supplement the following paragraph:

The quantity to be paid for shall be the calculated theoretical number of kilograms of reinforcing steel bars, mesh or mats as determined from the net length of the steel as shown on the drawings, incorporated in concrete and accepted. Reinforcing steel bars shall not be measured and paid separately where structures are paid in unit, as they are deemed to be included in the unit pay items of the structures.

The weight of plain or deformed bars or bar-mat will be computed from the theoretical weight of plain round bars of the same nominal size as shown on the following table:

Bar Designation	Size (mm)	Unit Weight (kg/m)
# 2	6	0.222
# 3	10	0.616
# 4	12	0.888
# 5	16	1.579
# 6	20	2.466
# 8	25	3,854

# 9	28	4.833
# 10	32	6.313
# 11	36	7.991

404.5 Basis of Payment

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
404 (1)	Reinforcing Steel (Grade 40)	Kilogram.
404 (2)	Reinforcing Steel (Grade 60)	Kilogram.

ITEM 405 STRUCTURAL CONCRETE

405.1 Description

405.1.2 Classes and Uses of Concrete

The first paragraph of this Sub-section is amended as follows:

Other than cement concrete pavement, concrete for bridge structures and except as otherwise stated in the Contract, the classes of concrete shall be designated as: Class A, B, C, P, Seal and Lean.

Lean concrete shall be used in thin layers underneath of footings, foundations and where shown on the drawings or as directed by the Engineer. Thickness shall be in conformance with the design Drawings.

As shown on the Drawings, the concrete class and strength for bridge shall be as follows:

Concrete Class	Structural Member Using
Class A	Steel sheet pile cap
Class AA	Pre-cast Reinforced Concrete Piles
Class AA1	Footings, pile cap, bored piles and approach slab
Class AA2	Cast-in-place girders, slabs, diaphragms, wingwalls, backwalls, copings, columns, slabs, shear keys, curb and sidewalk parapet/railing
Class B	Rubble concrete/concrete blocks for slope protection
Class C	Thin Reinforced Section such as railings and railpost
Class PP	Prestressed concrete members such as AASHTO girders, precast deck slab panels, cast-in-place post-tensioned slab, voided slab, integral coping beams, diaphragm

405.2 Material Requirements

405.2.3 Coarse Aggregates

Unless otherwise specified on the Drawings or as directed by the Engineer, the grading requirements for coarse aggregate shall be under Table 405.1 herein this Specification as follows:

TABLE 405.1 – Grading Requirements for Coarse Aggregate

Sieve Designation		Mass Percent Passing					
Standard (mm)	Alternate U.S. Std.	CLASS A	B	C	P	Seal	Lean
63	2 1/2"		100				
50	2 "	100	95-100				
37.5	1 1/2"	95-100	-				100
25	1"	-	30-70	100	100		95-100
19	3/4"	35-70	-	100	90-100	100	-
12.5	1/2"	-	10-30	90-100	-	90-100	25-60
9.5	3/8"	10-30	-	40-70	20-55	40-70	-
4.75	No. 4	0-5	0-5	0-15	0-10	0-15	0-10

405.4 Production Requirements

405.4.1 Proportioning and Strength of Structural Concrete

Add herein this Sub-section the following:

The maximum sizes of coarse aggregates shall be in accordance with the maximum sizes specified on the Drawings.

Table 405.2 Composition and Strength of Concrete for use in Structures

Classes of Concrete	Minimum Cement Content	Maximum Water/ Cement Ratio	Consistency Range in Slump	Designated Size of Coarse Aggregate	Minimum Compressive Strength of 150x300 mm Concrete Cylinder Specimen @ 28 days
	Kg(bag**)	Kg/kg	Mm (inch)	Square Opening Std.	MN/m2 (psi)
A	360 (9 bags)	0.49	50 - 100 (2 - 4)	38 - 4.75 (1 1/2" - No. 4)	21 (3000)
A1	360 (9 bags)	0.49	50 - 100 (2 - 4)	20 - 4.75 (3/4" - No. 4)	21 (3000)

AA	380 (9.5 bags)	0.42	50 - 100 (2 - 4)	20 - 4.75 (3/4" - No. 4)	28 (4000)
AA1	380 (9.5 bags)	0.42	50 - 100 (2 - 4)	25 - 4.75 (1" - No. 4)	28 (4000)
AA2	380 (9.5 bags)	0.42	50 - 100 (2 - 4)	20 - 4.75 (3/4" - No. 4)	28 (4000)
B	320 (8 bags)	0.54	50 - 100 (2 - 4)	50 - 4.75 (2" - No. 4)	17 (2500)
C	380 (9.5 bags)	0.49	50 - 100 (2 - 4)	15 - 4.75 (1/2" - No. 4)	21 (3000)
P	440 (11 bags)	0.34	80 - 100 (3.2 - 4)	19 - 4.75 (3/4" - No. 4)	38 (5500)
PP	As per design mix	0.33	80 - 100 (3.2 - 4)	20 - 4.75 (3/4" - No. 4)	41 (6000)
Seal	380 (9.5 bags)	0.58	100 - 200 (4 - 8)	25 - 4.75 (1" - No. 4)	21 (3000)
Lean	320 (8 bags)	0.54	50 - 100 (2 - 4)	50 - 4.75 (2" - No. 4)	17 2500

** Based on 40 kg/bag

405.6 Basis of Payment

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
405 (1) a	Structural Concrete, Class "A" (fc'=21 MPa), For Heavily Reinforced Structure	Cubic meter
405 (1) b	Structural Concrete, Class "A" (fc'=21 MPa), For Small and Medium Bridges Substructures	Cubic meter
405 (1) d	Structural Concrete, Class "A1" (fc'=21 MPa), For Small and Medium Bridges Superstructures	Cubic meter
405 (1) e	Structural Concrete, Class "AA1" (fc'=28 MPa), For Long Bridge Substructures	Cubic meter
405 (1) f	Structural Concrete, Class "AA2" (fc'=28 MPa), For Long Bridge Superstructures	Cubic meter
405 (2)	Structural Concrete, Class "B" (fc'=17 MPa), For Plain or Lightly Reinforced Structures	Cubic meter
405 (3)	Structural Concrete, Class "C"	Cubic meter

	(fc'=17 MPa), For Thinly Reinforced Members	
405 (4) b	Structural Concrete, Class "PP" (fc' = 41 MPa), For Prestressed Box Girders	Cubic meter
405 (6)	Lean Concrete, (fc' = 17 MPa)	Cubic meter

ITEM 406 PRESTRESSED CONCRETE STRUCTURES

This Item is modified to read as follows:

406.1 Description

This Item shall consist of precast prestressed concrete structures constructed in close conformity with the lines, grades and dimensions shown on the Drawings or established by the Engineer. It shall include the furnishing and installation of any appurtenant items necessary for the particular prestressing system to be used, including but not limited to ducts, anchorage assemblies and grout used for pressure grouting ducts.

406.2 Material Requirements

406.2.1 Concrete and Grout

a) Concrete

The material to be used for concrete shall conform to Item 405, Structural Concrete herein this Specification and it shall be class PP as shown in Table 405.2, Composition and Strength of Concrete for use in Structures.

b) Non-Shrink Grout

The non-shrink epoxy resin grout to be used shall be a formulation specifically designed for bonding prestressing steel to polyethylene ducts and in providing an acceptable barrier to prevent corrosion of the prestressing steel. The type of epoxy resin proposed by the Contractor shall be approved by the Engineer.

The Contractor shall provide to the Engineer copies of manufacturer's literature describing the epoxy resin for use and examples of its application in previous projects.

The epoxy resin shall be formulated such that after injection into the duct, the resin does not harden (cure) until after all the prestressing steel is stressed and anchored for each precast concrete unit. The epoxy resin shall not cure for a minimum of four weeks after injection.

The epoxy resin shall have the following mechanical properties:

Table 406.2.1 (b) Physical Properties after Hardening

Property	Required Value
Compressive Strength	70 N/mm^2
Tensile Strength	23 N/mm^2
Modulus of Elasticity	5,800 N/mm^2
Shear Adhesive Strength to Strand	13 N/mm^2
Durometer Hardness	85 to 90
Shrinkage Rate During Hardening	Below 1.0%

Heat Decomposition Temperature	Above 300 °C

The Contractor shall either perform a pullout test of the proposed system or provide copies of certified pullout test results provided by the manufacturer and shall satisfy the Engineer that the requirements given below have been met by the system.

Table 406.2.1 (c) Physical Properties after Hardening

Property	Required Value
19 Wire Strand Diameter	21.8 mm
Embedment Length of Strand	100 cm
Minimum Pull Out Strength	451 kN
Bond Strength	4.7 N/mm^2

406.2.2 Prestressing Reinforcing Steel

Reinforcing steel shall conform to AASHTO M31 (ASTM 615), grades 40 and 60 deformed with minimum yield strength as follows:

Rebar Grade	Yield Strength Fy (MPa)	Size (mm)
40	276 (40 ksi)	16 mm dia. and below, unless otherwise noted
60	415 (60 ksi)	20 mm dia. and above

406.2.3 Prestressing Steel

Prestressing steel shall be either twelve-wire, seven-wire, five-wire uncoated stress-relieved strands whichever is called for in the design Drawings and it shall conform to AASHTO M203 (ASTM 416) with minimum ultimate strength of fy = 1860 MPa (270,000 psi).

PC stress bar shall be high tensile cold worked stress bar conforming to ASTM A722/ISO 6934 (SBPR 930/1180 with nominal tensile strength of 1176 MPa) as shown on the Drawing.

All prestressing steel shall be protected against physical damage and rust or other results of corrosion at all times from manufacture to grouting. Prestressing steel that has sustained physical damage at any time shall be rejected.

406.2.4 Packaging, Storing and Shipping

Add this paragraph to read as follows:

The Contractor must exercise extra care in handling prestressing steel, and any damage observed shall be replaced immediately at his own expense.

Add this Subsection to read as follows:

406.2.9 Structural Steel, Bolts and Welds

The structural steel, bolts and welds to be used shall be in accordance with the requirements given below:

a) For Bridge No. 8 (Angat River Bridge)

Materials	Yield Strength fy (MPA)	Reference
Structural steel	250 (Grade 36)	AASHTO M270, (ASTM A709)
High strength bolts		AASHTO M253, ASTM A490 M
Welds		ANSI / AASHTO / AWS D1.5 Bridge Welding Code

b) For Bridge Nos. 9 and 10

Materials	Reference
Steel Plates and Rolled Shapes	AASHTO M183, (ASTM A36)
Bolts	AASHTO M164, (ASTM A325)
Welds	AWS D1.1 – 183, E70XX Series

406.3 Construction Requirements

All prestressed concrete structure works shall be in accordance with the requirements of Item 405, Structural Concrete and Reinforcing Steel shall be placed in accordance with the requirements of Item 404, Reinforcing Steel, and may be subject to the modifications and amendments by the Engineer.

406.3.7 Pre-tensioning

Add this paragraph at the end of this Section.

No prestressing works shall be commenced without the consent and presence of the Engineer.

406.3.8 Placing of Concrete

Add the following paragraphs at the end of this Section:

406.3.8.1 Concreting of PC Box Girder Using Balanced Cantilever Method

a) General

The Contractor shall construct the box girder by balanced cantilever erection method based on the following requirements:

1. In order to avoid inducing unbalanced moments on the column heads, the construction must proceed symmetrically on each side of each pier.

2. The Contractor shall not give any impact to uplift the cantilevered structure because only less reinforcing bar is arranged in bottom slab of the box girder for positive bending moment at the connection of cantilever girder.

3. The moving loads of traveling wagon with other equipment thereon, shall not exceed the sectional capacity of the box girder.

4. Concrete in box girder may be placed in two or three stages pouring operations. In both cases, the bottom slab shall be placed first. If the top slab is placed separately from the web, bond between the top slab and web shall be secured in such a way by artificially roughening the surface of the top of the web.

5. Each segment shall be prestressed and connected by main PC cables in order to support the next one. Hence for each segment cast, the designated numbers of cables in upper flange and in web shall be stressed in accordance with the sequence stated in the Drawings.

Deflection of the structure during erection and after completion shall be controlled as described in the following:

b) Control of Deflections Caused by Cantilever Erection

The Contractor shall submit to the Engineer for approval the full details of camber calculation and deflection control method during erection of each block and after completion of the bridge considering all factors such as:

1. Deflection due to the load of traveling forms and wagon before pouring concrete.

2. Deflection due to the weight of concrete.

3. Deflection due to the prestressing force.

4. Deflection due to the further weight of concrete and prestressing force for the further segments.

5. Deflection due the weight of pavement, sidewalks and railings, etc.

6. Deflection due to long creep and shrinkage in concrete.

7. Influence of the elastic deformation of traveling forms and wagon.

In the design, the weight of traveling wagon with full equipment is assumed to be 60 tonnes per each.

c) Placing Enclosures

Enclosures (sheathing) shall be rigidly supported in the exact positions as shown on the Drawings so that no movement can take place during casting concrete for girders.

The enclosures shall be placed with the following tolerance:

Vertical	± 10 mm
Horizontal	± 20 mm

When enclosures are placed on supports, these supports must be of metallic members such as reinforcing bars, angular steel, etc.

The supports shall be placed at adequate locations to ensure the tendons to be placed in the right position along the prescribed curve.

Two months before the placement of supports for enclosures, the Contractor shall submit the shop drawings of the supports to the Engineer for approval.

During the concreting and within the 24 hours after concreting, the Contractor shall demonstrate that all PC cables and bars already installed before concreting are still completely free to move.

All ducts shall be checked for damage before concrete placing. Any damage found to ducts due to concrete placing, the Contractor shall be responsible for taking countermeasures with the Engineer's approval.

406.3.8.2 Other Requirements for Concreting PC Box Girder

a) Traveling Wagon for Cantilever Erection

In the balanced cantilever erection of PC box girder, a cantilever construction device so called as traveling wagon shall be used. The traveling wagon consists of the supporting longitudinal and transversal steel frameworks, the steel sub-construction for bottom roadway, and console slab shuttering as well as for the working platforms, the rotary positioned steel suspension for the web shuttering, the necessary steel cross-bracing, the steel suspensions and steel anchorages (with suspension bars including accessories), the bracket drop hangers, the rails, the ground gears including rollers and rolling cars and the appertaining connection devices and the auxiliary legs and including chain blocks and hydraulic equipment for advancing and handling the machine. The wagon which will be anchored in the completed segmental PC box shall have functions supporting a segmental concrete box girder to be erected cast-in-situ, provision of scaffolding, and enough strength against wind load, self weight, dead load of the girder, and all other surcharge loads. The Contractor shall submit for the Engineer's approval shop drawings of the traveling wagon with the material list and structural calculation at least two (2) months before commencement of the erection.

c) Formwork

Steel forms shall be used for casting the PC box girder. The steel forms shall be made with the required gauge thickness, design and rigidity to prevent the surface of concrete from being undulate and bulging. As a result, concrete structure are required to have correct dimensions and shapes as shown in the drawings and have smooth surfaces.

Two months before the commencement of installation of formwork, the Contractor shall submit form setting elevation diagram of each block of the box girder obtained by the camber calculation to the Engineer for approval.

c) Tolerance for Structure

The accuracy of the in-situ concrete constructions shall be within the following tolerances:

- Length: The horizontal and vertical dimensions of concrete members, but not cross-sections, shall be within the following tolerances subject to a maximum of 25 mm.

Length (mm)	Tolerance (mm)
Up to 3000	8
3001 – 4500	10
4501 – 6000	15
Additional for every subsequent 5000 mm	+ 5 mm or – 5 mm

Removal of formworks shall be in accordance with the methods described in SPL 415, Falsework for PC Box Girder.

406.3.10 Post-tensioning

This Sub-section is supplemented as follows:

Tensioning of the prestressing reinforcement shall not be commenced until tests on concrete cylinders, manufactured of the same concrete and cured under the same conditions, indicate that the concrete of the particular structure to be prestressed has attained to its compressive strength of at least 28 MPa unless otherwise specified by the Engineer.

The proposed type of tendons which will be used in the post-tensioned designs and all necessary additional details including those for end anchorages, methods to be employed and procedures to be followed, shall be as approved by the Engineer. Portion of the tendons shall be draped longitudinal in parabolic portions. All tendons shall be placed so that their center of gravity will be at the position shown on the Drawings. The total post-tension force after losses required at mid-span shall be provided as called for in the various designs. The required forces after losses shall be obtained by applying initial tensile forces of sufficient magnitude to allow for all subsequent, including those for elastic shortening, shrinkage, creep, relaxation, friction, and efficiency of end anchorages. After securing the end anchorages, all tendons shall be pressure grouted in their conduits in accordance with the requirements specified on the Drawings or by the Engineer.

406.3.10.1 Tensioning of PC Box Girder:

The Contractor shall submit full details of jacking force calculation, prestressing sequence and control method of each cable to the Engineer's approval not later than 2 months before any prestressing works will start. Post-tensioning works shall be carried out in the following manner:

1. Tensioning shall be carried out only in the presence of the Engineer or his representative unless written permission has been obtained to the Contractor.

2. Immediately before tensioning, the Contractor shall prove that all tendons are free to move between jacking points and that members are to accommodate the horizontal and vertical movements due to the application of prestress.

3. Unless otherwise described in related Specifications, concrete shall not be stressed until it has been reached to 41 MPa strength obtained from the result of

average values of the concrete compression test using three cylinders. The test cylinders shall be made and tested in accordance with the concrete testing standards. The Contractor shall cast sufficient number of cylinders to demonstrate that the required strength of concrete is reached.

4. The Contractor shall add the forces described in approved tensioning method with an allowance for anchorage friction and jack losses. The total forces and calculated elongation shall be specified in the prestressing control system.

5. Immediately after tensioning, the stress in the prestressing tendons shall not exceed either 70 percent of their ultimate strength or 85 percent of yield strength whichever is lower. During stressing, the value shall not exceed either 80% of their ultimate strength or 90 percent of yield strength whichever is lesser.

6. The strength shall be stressed at gradual and steady rate. The force in the tendons shall obtain from readings on pressure gauges incorporated in the equipment. The average difference between calculated and measured elongation for a group of tendons in a structure should be as shown in the table below:

Number of Tendons	Allowable Difference Between Calculated and Measured Elongation
4	5%
6	4%
More than 10	3%

7. If the elongation cannot be reached, the jacking force may be increased to 80% of the ultimate strength or 90% of yield strength of the tendon whichever is lesser. If the difference between the measured and calculated elongation is still more than the allowed value, no further tensioning shall be made until the calculations and equipment are checked and the cause of the problem is determined. Stressing method and degree of stressing for tendons shall be modified with the Engineer's approval as necessary to provide the required pretensioning forces.

8. Unless otherwise specified on the Drawings, longitudinal main tendons shall be stressed from both ends. The pull-in at both ends shall be accurately measured and the required allowance shall be taken into consideration in the measured elongation.

9. Longitudinal stressing of the main tendons shall not from one end unless otherwise required on the Drawings or specified in the prestressing control system. Vertical and transverse stressing shall be made from one end.

10. When the prestressing has been applied according to the approved system, the tendons shall be anchored. The jack pressure shall then be released in such a way as to avoid shock to the anchorage or tendons.

11. If the pull-in of the tendons at completion of anchoring is greater than that of the approved by the Engineer, the load shall be released at a gradual and steady rate and tensioning is carried out fresh.

12. The Contractor shall submit, within the following day of the tensioning, full records and control graphs of all tensioning operations including the measured elongation, pressure gauge or load cell readings and the amount of the pull-in at each.

406.3.13 Handling

Extreme care shall be exercised by the Contractor in handling and moving the precast prestressed concrete girders and precast prestressed concrete slab. These girders and slabs shall be transported and maintained in an upright position and the points of support and directions of the reactions with respect to the member shall be shall be approximately the same during transportation and storage as when the members are in their final position. If the Contractor deems it expedient to transport or store precast units in other than this position, it shall be done at his own risk after notifying the Engineer of his intention to do so.

Any precast prestressed concrete member shall not be transported until it has attained to its compressive strength equal to the specified design compressive strength of the concrete and has attained a minimum age of 14 days.

406.4 Method of Measurement

1) The quantity to be measured for payment shall be the actual number of Precast Prestressed Concrete Girders of designated types and sizes, installed in place, completed and accepted by the Engineer.

   The quantities determined herein for precast prestressed concrete members shall include the furnishing of materials, fabrication, haulage and erection of precast PC members, preparation of the fabrication and storage yards with necessary equipment and facilities, concrete works, formworks, reinforcements, installation, sheaths, grout, grid bars, prestressed concrete cables and anchorages, prestressing and all other related works and materials necessary to be included to complete the Item.

2) Prestressing steel and Prestressing Bar shall be measured by its total net weight in kilogram as shown in the Bill of Quantities. The costs exclude the weight for anchorages, sheath, grout, grid bars, and cut-offs.

406.5 Basis of Payment

The accepted quantities as provided in Section 406.4, Method of Measurement shall be paid for at the Contract unit price shown in the Bill of Quantities, which price and payment shall be full compensation for furnishing and placing of all materials, including all labor, equipment, tools and incidentals necessary to complete the work prescribed in this Item.

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
406 (1) g	Prestressed Structural Concrete Members (AASHTO Girder Type V, L = 29.4 m)	Each
406 (1) h	Prestressed Structural	Each

	Concrete Members (AASHTO Girder Type V, L = 29.55 m)	
406 (1) n	Prestressed Structural Concrete Members (AASHTO Girder Type VI, L = 40 m)	Each
406 (3) a	Prestressing Steel 12T-12.7mm diameter	Kilogram
406 (3) b	Prestressing Steel 5T-12.7mm diameter	Kilogram
406 (3) c	Prestressing Bar, 32mm diameter (PC Box Girder Transversal in Top Slab)	Kilogram
406 (3) c	Prestressing Bar, 32mm diameter (PC Box Girder in Vertical Web)	Kilogram

ITEM 407 CONCRETE STRUCTURES

Modify this Item to read as follows:

407.1 Description

This Item shall consist of the general description of the materials, equipment, workmanship, and construction requirements of concrete structure works conforming to the design, dimensions and details shown on the Drawings.

407.2 Material Requirements

407.2 (4) Elastomeric Bearing Pads

Delete the sentence and replace with the following:

Elastomeric bearing pad shall be 100% virgin chloroprene (neoprene) pads with durometer hardness 60 and shall be laminated and non-corrosive mild steel sheets. It shall conform to the requirements prescribed in DPWH Department Order No. 25, Series of 1997 "Revised DPWH Standard Specifications for Elastomeric Bearing Pad".

Duro Hardness, Shore A (ASTM D-2240)	60 ± 5
Tensile Strength ASTM	D 412-175 kg/cm^2 (min)
Ultimate Elongation %	350% (min)
Material	Neoprene

407.2 (8) Expansion Joint

Expansion joint shall satisfy the requirements of bridge deck movement caused by temperature change, shrinkage, creep and traffic load. Its metal plates and angles shall be corrosion proof. It shall be water tight, durable, resistant to vehicle sliding, noiseless and smooth drive, capable of absorbing the vehicle load and the horizontal forces and it shall be easy to install.

a) Long Bridge

The expansion joint for long bridge shall be ± 50mm, ± 70mm, and ± 100mm movement with 10 mm thick epoxy mortar as called for and shown on the Drawings.

The steel components shall be manufactured in accordance with the requirements of ASTM A36. The rubber material shall be based on Neoprene rubber compound following to ASTM Test Method as follows:

Physical Properties	Test Method	Required Specification
Hardness (Shore A)	D 2240	50 ± 5
Tensile Strength (MPa)	D 412	13 Min.
Elongation at Break	D 412	400 Min.
Low Temperature Brittleness (30 min. at -40 °C)	D 746	No Brittle
Compression Set (After 22 hours at 70 °C)	D 395	20 % Max.
Ozone Resistance, (After 72 hours at 40 °C, 20% strain 100 pphm)	D 1149	No Crack
Oil Resistance in ASTM No. 3 oil (168 hours at 25 °C, volume charge	D 471	15% Max.
Flame Resistance	C 542	Must not propagate flame

Asphalt joint filler (transition strip) shall be applied having thickness and width shown on the Drawings. Asphalt sealant will also be used on the longitudinal bolt holes after final fixing of the joints.

b) Short Bridges

The expansion joint for carriageway of the short bridges shall be ± 40mm movement with 10 mm thick epoxy mortar as called for and shown on the Drawings. The steel components shall be manufactured in accordance with the requirements of ASTM A36. The rubber material shall be based on Neoprene rubber compound conforming to the physical properties, test method and required specification on the above table.

For bridge sidewalk of the short bridges, expansion joint shall be 30mm x 50mm premolded joint filler as shown on the Drawings.

Sealant shall be guaranteed against leakage, cracking, crumbling, melting, shrinkage, running, loss of adhesion for a period of 5 years from the date indicated on the Acceptance Certificate of the Works.

Joint sealer for the sidewalk of bridges shall conform to AASHTO M 173 hot poured elastic type or equivalent and be installed as shown on the Drawings.

The expansion joint material shall have a 15-year warranty period. Damages on the joint within this period shall be replaced by the Contractor.

The Contractor is required to submit the manufacturer's brochure and specifications to the Engineer for approval.

Add this Sub-section to read as follows:

407.2 (9) Restraining Bar

a) All metals to be used for restraining bars shall be hot-dip galvanized in accordance with the specifications for zinc (hot-galvanized) coatings conforming to AASHTO MIII (ASTM A 123) or AASHTO M 232 (ASTM A 153). The weight of zinc coating shall average to not less than 365 grams per square meter of actual surface area with no individual specimen having a coating of less than 305 grams per square meter.

b) Stress bar to be used shall be 32 mm diameter and inscribed into 50 mm diameter PVC pipe sleeve.

c) Elastomeric pad of 450 mm diameter shall be Duro 60 having thickness equals 40mm and attached to distribution plate by epoxy.

d) Bolts and nuts for anchorages shall be in accordance with the requirements of AASHTO M 253, ASTM 490 M and it shall be corrosion resistant.

e) Epoxy resin grout as sealant shall be applied to prevent movement on restraining bar and it shall be in accordance with the requirements described in Item 406, Prestressed Concrete Structures.

407.2 (10) Bridge Drainage

Bridge drain shall be of standard galvanized iron pipe with the diameter of 150 mm or as shown on the Drawing.

407.3 Construction Requirements

407.3.1 Handling and Placing Concrete: General

Add the following paragraph:

Prior to concreting works, it is necessary for the Contractor and the Engineer to closely work together to check all related elevations, installation of reinforcements and the stability of formworks and falsework to avoid unusual problems during and after the execution of work. Proper scheme during concrete placing shall be properly defined on the drawings and working platform must be provided as necessary. In the concreting scheme, the manpower, materials, and equipment set up will be properly indicated on the drawings in order to maximize the working efficiency at the same time maintaining the safety working environment.

407.3.10 Falsework Construction

The following paragraphs shall be supplemented to read as:

Falsework which includes formworks and scaffoldings shall be designed correctly by the Contractor according to his construction methodology and his falsework drawings shall be submitted to the Engineer for review and approval. Falsework shall be so designed in order to carry the maximum loads imposed on it and in order to prevent deformation, deflections and deviations due to loads and vibrations during concrete placing. No falsework construction shall start until the Engineer has reviewed and approved the design.

Inner forms surface shall be coated with the quality form oil prior to placing of concreting and must be mortar tight with sufficient strength and rigidity in order to maintain its

shape according to Drawings after concreting work. Forms to be utilized must have a smooth surface in order to attain a true concrete surface finished product.

Add the following paragraphs to read as follows:

407.3.15 Expansion Joint Installation

Installation for expansion joints for long bridges shall be in accordance with the manufacturer's installation procedures. For short bridges, it shall be in accordance with the requirements of the design drawings and with the direction of the Engineer.

The position of expansion joint and all anchor bolts cast into concrete shall be accurately determined from the template or other materials. During the placing and hardening of concrete or mortar under expansion joint components, relative movement shall be prevented between them and support to which they are being fixed.

407.3.16 Restraining Bar Installation

Restraining bar shall be properly installed at the required location and it shall be in accordance with the details shown on the Drawings.

Stress bar of 32 mm diameter shall be inscribed into a 50 mm diameter PVC pipe sleeve passing through a 36 mm diameter holes in elastomeric pad and distribution plates and be sealed with epoxy resin grout to prevent movement on restraining bar.

Elastomeric pad shall be attached into the distribution plates by using epoxy.

407.4 Method of Measurement

a) Elastomeric Bearing Pad

The quantity to be paid for shall be measured by the total number of bearing pads of its dimensions and thickness shown on the Drawings, completely installed and accepted by the Engineer. The payment includes the cost for anchorages, mortar bed, grouting and all other necessary works to complete the work.

b) Expansion Joint

The quantity to be paid for shall be measured by the total length in linear meters of its type and total movement shown on the Drawings, completely installed and accepted by the Engineer. The payment includes the cost for anchorages, provision of base, grouting, sealing and all other necessary works to complete the work.

c) Restraining Bar

The quantity to be paid for shall be measured by the total number of restraining bars installed. The payment includes the cost for elastomeric pads, pipe sleeve, epoxy grout, bolts and nuts, spirals and other necessary appurtenances to complete the installation of restraining bars.

d) G.I. Drain Pipe

The quantity to be paid for shall be measured by the total lengths of drain pipe installed. The payment includes cost for all appurtenances necessary to complete the work.

407.5 Basis of Payment

The accepted quantity as provided in Section 407.4, Method of Measurement shall be paid for at the Contract unit price shown in the Bill of Quantities which price and payment shall be full compensation for furnishing materials, labor, tools, equipment and other incidentals necessary to complete the particular work.

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
407 (1) b	Elastomeric Bearing Pad (600x300x50mm), Duro 60	Each
407 (1) c	Elastomeric Bearing Pad (600x350x50mm), Duro 60	Each
407 (1) d	Elastomeric Bearing Pad (600x700x89mm), Duro 60	Each
407 (2) a	Expansion Joint, (for ± 40 mm Movement)	Linear Meter
407 (2) c	Expansion Joint, (for ± 50 mm Movement)	Linear Meter
407 (2) d	Expansion Joint, (for ± 70 mm Movement)	Linear Meter
407 (2) e	Expansion Joint, (for ± 100 mm Movement)	Linear Meter
407 (2) g	Expansion Joint, 30mm x 50mm Premolded Joint Filler for Bridge Sidewalk	Linear Meter
407 (3) a	Restraining Bars, 32mm x 1495mm	Each
407 (3) b	Restraining Bars, 32mm x 1900mm	Each
407 (4)	G.I. Drain Pipe, dia.=150mm for Bridge Drainage	Linear Meter

SPL ITEM 407 (5) a PIER PROTECTION CONCRETE BLOCKS

SPL 407 (5) a.1 Description

This special item of work shall consist of placing, adjusting and jointing precast concrete blocks in accordance with the elevation shown on the Drawing. The purpose of placing concrete blocks around the pier is to protect the pier from damage due to the turbulence of floodwater. The concrete blocks shall be of its type, sections and dimensions shown on the Drawing.

SPL 407 (5) a.2 Material Requirements

Concrete to be used for concrete blocks shall be Class B in conformance to the requirements of Item 405, Structural Concrete.

Reinforcements shall be in conformance to the requirements of Item 404, Reinforcing Steel.

SPL 407 (5) a.3 Construction Requirements

Concrete blocks shall be precasted according to its designs, sections and types shown on the Drawing. All concrete and reinforcement works shall be in accordance with the requirements of Item 405, Structural Concrete and Item 404, Reinforcing Steel respectively.

Placing and jointing of concrete blocks of their types shall be in accordance with the arrangement shown on the design Drawing. Joints shall be properly connected by welding in accordance with the welding requirements described by the Engineer. Joints shall be coated with the required paint prescribed by the Engineer to protect them from rust.

SPL 407 (5) a.4 Method of Measurements

The quantity to be paid for shall be measured by the total area covered with concrete blocks in square meter basis.

Excavation, shoring, cribbing and other related work required for concrete block setting and hand-laid embankment will not be paid directly, but shall be considered as a subsidiary obligation of the Contractor under Pay Item 103 (2) a, Bridge Excavation, Common, A.O.W.L. and Item 103 (2) b, Bridge Excavation, Common, B.O.W.L.

SPL 407 (5) a.5 Basis of Payment

The quantities determined in Section SPL 414.4, Method of Measurement will be paid at the Contract unit price in the Bill of Quantities which price and payment shall be full compensation for furnishing material, labor, tools, equipment, and incidentals necessary to complete the Item.

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
SPL 407 (5) a	Pier Protection Concrete Blocks (For Angat Bridge)	Square Meter

SPL ITEM 420 (2) a REALIGNMENT OF RIVER/STREAM

SPL 420 (2) a.1 Description

This special Item shall consist of realignment of the upstream and downstream of river/stream in accordance with the lines, grades, elevations, limits and dimensions shown on the Drawing. Strictly close supervision by the Engineer is required during the actual excavation, shaping, trimming of river/stream bed and sloped surface, and backfilling and compaction works.

The Contractor shall submit to the Engineer for approval his realignment methodology and equipment to be used at a given time specified by the Engineer.

Realignment work shall commence upon receipt of written request from the Engineer.

SPL 420 (2) a.2 Material Requirements

SPL 420 (2) a .2.1 Hand-laid Rock Embankment

Hand-laid rock shall be more than 0.015 cu.m. in volume and shall consist of hard and durable stones as required in Item 506, Hand-Laid Rock Embankment.

SPL 420 (2) a.2.2 Steel Sheet Piles

Steel Sheet Piles shall be FSP IA (SY 30), 400 x 85 x 8mm (Fy = 300 MPa) having length of 9 meters as shown on the Drawing and shall conform to Item 507, Sheet Piles.

SPL 420 (2) a.2.3 Gabions

Gabions of 1m x 2m x 0.50m to be used shall be in accordance with the requirements of Item 509, Gabions.

SPL 420 (2) a.3 Equipment

Backhoe to be used for excavation under and above water level shall be recommended by the Contractor based on his methodology submitted and it shall be approved by the Engineer prior to commencement of excavation work.

Loader for hauling and disposal of excavated materials shall be as recommended by the Contractor and approved by the Engineer.

All recommended equipments shall be approved by the Engineer prior to the start of work in which such are intended to be used.

SPL 420 (2) a.4 Construction Requirements

Based on the Consultant's Drawings for realignment of river/stream, the Contractor is responsible for the actual verification in the field, the exact location, elevations and dimensions. The Contractor shall notify immediately the Engineer regarding the difference between the Drawings and the actual situation of the river/stream.

Upstream and downstream portion will be realigned by excavating the silted and shallow portion of the river by using the Contractor's recommended equipments which are approved by the Engineer. Excavated materials not intended for future use or for backfill and embankment shall be hauled and disposed immediately to the area wherein no possibility of materials to come back to the river during rainy season especially during heavy rains. Disposal area shall be as designated by the Engineer.

The excavated channel will be shaped and trimmed according to the designed slope, grade, elevation and dimensions shown on the Drawings. Channel surface shall be properly compacted and prepared prior to the installation of hand-laid rock embankment and gabions.

All materials excavated and selected for backfill and embankment shall be hauled right away to the area they are intended to be used. The materials shall be spread properly and compacted according to the requirements specified by the Engineer.

Steel sheet piles shall be driven in accordance to the requirements specified by the Engineer.

The Contractor shall submit his actual realignment drawings and reports each week at the specified time and day given to him by the Engineer. The Engineer will thoroughly review the drawings and reports of the Contractor and in case there is discrepancy to the actual, the Engineer has the right to stop the realignment work. The work shall not be resumed unless written permission by the Engineer is given to the Contractor.

SPL 420 (2) a.5 Method of Measurement

a) The realignment work will be measured and paid for on a lump sum basis inclusive only of excavation, backfilling, shaping, trimming, compaction and hauling of excavated materials to designated disposal area. The Contractor is required to breakdown the inclusive works he rendered in the realignment operation with the corresponding cost. Costs included in the list but not rendered in the actual work will not be paid. Furthermore, excavation that goes beyond the construction limits will not be paid.

The calculations of quantities and payment of the above material requirements herein this Item will be made and paid for under the Items where they are called for like:

b) Hand-laid rock will be paid under Item 506, Hand-Laid Rock Embankment.

c) Steel sheet piles will be paid under Item 507, Sheet Piles.

d) Gabions will be paid under Item 509, Gabions.

SPL 420 (2) a.6 Basis of Payment

The accepted quantity measured as prescribed in Section 420 (2).5, Method of Measurement shall be paid for at the Contract unit price shown in the Bill of Quantities. The payment shall constitute full compensation for all labor, equipment, tools and incidentals necessary to complete the realignment work.

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
SPL 420 (2) a	Realignment of River/Stream	Lump Sum

SPL 420 (3) FALSEWORK FOR PC BOX GIRDER

SPL 420 (3).1 Description

This Item shall consist of the design and construction of formwork, in accordance with these special provisions and in such a manner as to steadily support in place, the formwork with its load of freshly cast concrete structure until the concrete has attained the percentage of the specified design strength as required in these special provisions.

This item shall include in its scope, the removal in due time, of the faselwork and its reuse and/or disposal, all in accordance with these special provisions and the prior approval by the Engineer.

SPL 420 (3).2 Material Requirements

Falsework materials to be used for stagings shall be made of structural steel, comprising of jacks, columns, H-beam brackets, H-beams, C-beams, angular steel bracing and other manufactured devices or combination of timber and steel frames as approved by the Engineer. Falsework shall also include falsework – footings.

Formworks for Traveler Form or Wagon to be used for cantilevering shall be of steel material or combination of steel and timber materials and shall be approved by the Engineer.

Suspended formworks to be used for center span closures shall be of durable timber material. It shall be smooth in texture and shall be approved by the Engineer.

SPL 420 (3).3 Falsework Design and Drawings

Detailed working drawings and supporting calculations of the falsework, shall be furnished by the Contractor to the Engineer. No falsework construction shall start until the Engineer has reviewed and approved its design. The Contractor shall provide sufficient time for the Engineer to complete this review. Such time shall be proportionate to the complexity of the falsework design and in no case shall it be less than two weeks.

The Contractor may review and revise the falsework drawings at any time provided that sufficient time shall be allowed for the Engineer's review and approval of the same, before construction is started on the revised portion.

The falsework drawings shall include a superstructure-placing-diagram showing proposed concrete-placing sequence and construction joint locations, except that where a schedule for placing concrete is shown on the Contract Plans, no deviation will be permitted therefrom, unless approved in writing by the Engineer.

The Contractor on the falsework drawings shall indicate anticipated total settlements of falsework and forms. These should include that "falsework footing settlements over 20 mm will not be allowed unless otherwise permitted by the Engineer".

Detailed calculations by the Contractor showing the stresses, deflections, and camber necessary to compensate for said deflections in all load-supporting members, shall be supplied.

After approving the Contractor's falsework deflection camber, the Engineer will furnish to the Contractor the magnitude of camber necessary to compensate for vertical alignment or anticipated structure deflection, if this is not shown on the drawings. The total camber used in constructing falsework shall be the aggregate of the aforementioned cambers.

SPL 420 (3).4 Falsework Construction by Cantilever Method

The falsework shall be constructed conforming to the falsework drawings. The materials used in the falsework construction shall be of the quantity and quality necessary to withstand the stresses imposed. The workmanship used in falsework shall be of such quality that the falsework will support the loads imposed on it without excessive settlement or take-up beyond that shown on the falsework drawings.

a) Stage 1: Pier Head and Initial Blocks

Initial blocks on piers P15 and P20 shall be constructed on temporary steel bracket support with plywood combination and shall be installed at the head of the piers.

b) Stage 2: Piers P15 and P20 Balanced Cantilever Construction

After the completion of initial blocks, form traveler or wagon shall be assemble on the established blocks. Then the construction of each block shall commence from the existing block to both sides by cantilever method using "wagon" simultaneously.

Preparation for side span construction works starts. Initial blocks for piers P16 and P19 are carried-out.

c) Stage 3: Piers P14 and P21 Side Span Construction + Piers P16 and P19 Balanced Cantilever Construction

Side spans construction by staging (supports/shoring) shall be done simultaneously with the balanced cantilevering at piers P16 and P19. Initial blocks for piers P17 and P18 are also carried-out.

d) Stage 4: Center Span Closure + Piers P17 and P18 Balanced Cantilever Construction

Upon completion of piers P16 and P19 by balanced cantilever method, suspended formworks shall be done simultaneously at the center span closures between piers P15 and P16 and between piers P19 and P20. Piers P17 and P18 by balanced cantilever method shall be done also simultaneously with the construction of center span closures.

e) Stage 5: Center Span Closures

Upon completion of piers P17 and P18 by balanced cantilever method, construction of center span closures by suspended formworks shall be done simultaneously between piers P16 and P17 and between piers P18 and P19, then stressed to complete the main bridge.

f) Stage 6: Center Span Closure

Final center span closure between piers P17 and P18 shall be constructed by using the suspended formwork.

g) Stage 7: Finishing Work

At this stage, all miscellaneous works including surfacing are carried-out.

Should unanticipated events occur, including settlements that deviate more than ±20 mm from those indicated on the falsework drawings, which in the opinion of the Engineer would prevent obtaining a structure conforming to the requirement of the Specification, the placing of concrete shall be discontinued until corrective measures satisfactory to the Engineer, are provided. In the event, satisfactory measures are not provided prior to initial set of the concrete in the affected area, the placing of concrete shall be discontinued at a location determined by the Engineer. All unacceptable concrete shall be removed.

SPL 420 (3).5 Removal of Forms and Falsework

Unless otherwise shown on the drawings, or permitted by the Engineer, falsework supporting any girder shall not be released before 14 days after the last concrete

Falsework removal for cantilevered structures, shall be as directed by the Engineer or shall be such that the structure is gradually subjected to its working stress.

In addition to the above requirements, no falsework for PC box girder shall be released until the supported concrete has attained a compressive strength of at least 80% of the

required 28-day strength. Falsework for cast-in place prestressed portion of structure shall not be released until after the prestressing steel has been tensioned.

Forms and falsework shall not be removed without the consent of the Engineer. The Engineer's consent shall not relieve the Contractor of his responsibility for the safety of the work. Blocks and bracing shall be removed at the time the forms are removed and in no case shall any portion of the wood forms be left in the concrete.

When concrete strength tests are used for removal of forms and supports, such removal should not begin until the concrete has attained the percentage of the specified design strength. The minimum time prior to removal of forms and falsework shall be 14 days having a minimum percentage of design strength to 80%.

The Contractor shall retain ownership of the temporary forms and falsework throughout the construction period and even after the completion of the Contract. The said forms may be reused for other concrete structure construction under the Contract, subject to the prior inspection and approval by the Engineer. This condition of cost-advantage to the Contractor should therefore be taken into consideration in the fair determination of the Contract unit price of temporary formwork and of falsework.

All debris and refuse resulting from work shall be removed and the site left in a neat and presentable condition.

SPL 420 (3).6 Method of Measurement

Falsework will be measured by the lump sum. It includes structural steel falsework or combination of steel and timber whichever is approved by the Engineer.

SPL 420 (3).7 Basis of Payment

The accepted quantities measured as prescribed in Section SPL 415.6, Method of Measurement shall be paid for at the Contract unit price shown in the Bill of Quantities. The payment shall be full compensation for furnishing, preparing, fastening and complete construction of the required falsework and formworks and for all labor, equipment, tools and incidentals to complete the Item. Said payment shall also constitute full compensation for the removal, and / or disposal of the said falseworks and formworks. Reuse of materials will affect the cost of materials. If the Engineer permits reuse of materials, the number of reuse approved by the Engineer will divide the cost of materials.

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
SPL 420 (3)	Falsework (PC Box Girder for Angat Bridge)	Lump Sum

SPL ITEM 420 (4) TEMPORARY CRANEWAY

SPL 420 (4).1 Description

This special Item shall consist of the construction of temporary craneway which may be bridge type structure that is necessary in connection with the construction of bridge.

The Contractor is required to design the temporary craneway based on his methodology upon written request by the Engineer. He can use the consultant's designed drawings as reference for his planning and designing the structure. He then submits his own design of temporary craneway and construction procedures to the Engineer for approval at a given time specified by the Engineer.

Construction for temporary craneway shall be started immediately after receipt of the written approval from the Engineer.

SPL 420 (4).2 Material Requirements

Steel H-Piles shall be in accordance with the requirements of AASHTO M 183. Other steel materials shall meet the requirements of Item 712, Structural Metal and Item 409, Welded Structural Steel.

SPL 420 (4).3 Construction Requirements

Prior to commencement of craneway construction, the Contractor at the given number of days specified by the Engineer, shall submit a detailed construction drawing of the craneway with structural analysis based on the latest topographic survey (S = 1/500) taken in the preconstruction survey stage. The Contractor may use the consultant's drawings for designing temporary craneway as his reference only. Applicable design live load for craneway design shall be MS-18 in AASHTO or gross weight of 80 tonne trailer whichever produces the severe effect for a member to be designed.

All piling works for the construction of temporary craneway shall strictly be in accordance with the piling requirements specified under Item 400, Piling, and shall be with close supervision by the Engineer and the Contractor's expert of said work.

Construction of temporary craneway shall be as directed and approved by the Engineer. The Contractor must construct the temporary craneway properly and strong that it would give safety to the equipments using and to the workers as well during the construction of bridge.

It will be the sole responsibility of the Contractor to maintain and repair the craneway at his own expense during the entire construction period.

After the completion of the main bridge, the Contractor is responsible at his own expense for the removal of the craneway and the restoration of the river bank to its original position.

SPL 420 (4).4 Method of Measurement

Temporary craneway shall be measured by the completed span in linear meter and shall include all materials, equipment and labor used to finish the structure as called for in the Bill of Quantities.

Damages inflicted on the craneway as a result of typhoon and floods shall not be a basis for claim of any manner against the Client and it is the obligation of the Contractor to restore and repair the damages at his own expense.

SPL 420 (4).5 Basis of Payment

The accepted quantities, measured as prescribed in Section 420 (4).4, Method of Measurement shall be paid for at the Contract unit price shown in the Bill of Quantities. The payment shall constitute full compensation for furnishing and placing of all materials, undertaking proper maintenance and providing safety measures, as required in the Specifications or as directed by the Engineer, including all labor, equipment, tools and incidentals necessary to complete the structure including the subsequent removal upon completion of the permanent work.

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
SPL 420 (4)	Temporary Craneway (For Angat Bridge)	Linear Meter

SPL ITEM 420 (5) TEMPORARY ACCESS ROAD (CAUSEWAY)

SPL 420 (5).1 Description

This Item shall consist of the construction of temporary access road of causeway type including the necessary embankment and placing of required stones and compaction and shall be in accordance with the lines, grades and dimensions shown on the Drawing. Proper maintenance and safety provisions shall be made and monitored for the completed access road to ease public traffic. The temporary access road will be placed at locations and elevations as indicated on the Drawings or as directed by the Engineer.

SPL 420 (5).2 Material Requirements

Materials for embankment of temporary access road shall be of the same kind, grade and sizes in accordance with the material requirements described in Item 104, Embankment as approved by the Engineer.

Materials shall comply with pertinent provisions for fill and construction of gravel roads specified in Item 201, Aggregate Base Course and shall be approved by the Engineer. The required thickness shall not be less than 200 mm as shown on the Drawing.

SPL 420 (5).3 Construction Requirements

The Contractor at a given number of days specified by the Engineer, shall submit his construction plans and information regarding the manner in which he intends to comply with the works and for the maintenance of the temporary access road and safety provisions, for the Engineer's review and approval prior to construction.

The construction of temporary access road shall comply with applicable provisions for Gravel Road Construction in the Specifications or as had shown on the Drawings.

It will be the sole responsibility of the Contractor to maintain and repair the temporary access road at his own expense during the entire construction period.

If temporary access road is no longer be required and if directed by the Engineer, after completion of the main construction, the Contractor is responsible at his own expense for the removal of the temporary access road and the restoration of the area to its original position.

SPL 420 (5).4 Method of Measurement

Temporary access road shall be measured for payment by linear meter and shall include all materials, equipment and labor used to finish the structure as called for in the Bill of Quantities.

SPL 420 (5).5 Basis of Payment

Temporary access road will be paid for as prescribed in Section 420 (5).4, Method of Measurement which price and payment shall constitute full compensation for furnishing and placing of all materials, undertaking proper maintenance and providing safety measures, as required in the Specifications or as directed by the Engineer, including all labor, equipment, tools and incidentals necessary to complete the work including the subsequent removal and disposal of materials used in the temporary access road as directed by the Engineer.

If temporary access road is no longer be required, and if directed by the Engineer, suitable materials used as fill, subbase or as surfacing for the temporary access road may be placed in the permanent road construction and paid for as embankment materials or as appropriate subbase or surfacing Item.

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
SPL 420 (5)	Temporary Access Road (Causeway type) (For Angat Bridge Construction)	Linear Meter

SPL ITEM 420 (6) TEMPORARY COFFERDAM FOR PIER CONSTRUCTION

SPL 420 (6).1 Description

This special Item shall consist of constructing temporary cofferdam to enclose the specified area for pier construction in accordance with the type and location shown on the Drawing.

The Contractor is required to design the temporary cofferdam based on his methodology upon written request by the Engineer. He can use the consultant's designed drawings as reference for his planning and designing the structure. He then submits his own design to the Engineer for approval at a given time specified by the Engineer.

SPL 420 (6).2 Material Requirements

Steel sheet piles to be used as inner and outer enclosures of cofferdam shall be Type IV in conformance to the requirements of AASHTO M 202 (ASTM A 328) or AASHTO M 223. The joints shall be watertight when the piles are in place.

All other steel materials required for the construction of cofferdam as listed in the design drawing shall be in accordance with the requirements of Item 712, Structural Metal.

SPL 420 (6).3 Construction Requirements

The Contractor shall submit together with his design drawing the construction methodology in constructing temporary cofferdam for pier construction. Steel sheet piles shall be driven to the required depth by the piling equipment recommended by the Contractor and approved by the Engineer.

Upon completion of driving the inner and outer steel sheet piles, the two driven sheet piles must be properly tied up by tie rods on steel waling as shown on the Drawing. To strengthen the position of cofferdam, two (2) steel H-posts must be driven at every corner portion of the outer steel sheet pile. To prevent water from coming into the cofferdam during and after pumping operation, the space between the two steel walling shall be filled with soil/sand then compacted by compaction equipment recommended by the Contractor and approved by the Engineer. Water shall be pumped out from the cofferdam by using the required pumping equipment recommended by the Contractor and approved by the Engineer. Dewatering of cofferdam shall be continuous operation until the existing river bed is exposed.

SPL 420 (6).4 Method of Measurement

The quantity to be paid for shall be measured by the total number of temporary cofferdams constructed, completed and accepted by the Engineer. Cost for pumping water is included.

SPL 420 (6).5 Basis of Payment

Temporary cofferdam will be paid for as prescribed in Section 420 (6).4, Method of Measurement which price and payment shall constitute full compensation for furnishing and placing of all materials, undertaking proper maintenance and providing safety measures, as required and directed by the Engineer, including all labor, equipment, tools and incidentals necessary to complete the work including the subsequent removal and disposal of materials used in the temporary cofferdam as directed by the Engineer.

Payment will be made under:

Pay Item No.	Description	Unit of Measurement
SPL 420 (6) a	Temporary Cofferdam for Pier Construction (for Angat Bridge Type 1)	Each
SPL 420 (6) b	Temporary Cofferdam for Pier Construction (for Angat Bridge Type 2)	Each