Section IV.

General Conditions of Contract

1. Scope of Contract

This Contract shall include all such items, although not specifically mentioned, that can be reasonably inferred as being required for its completion as if such items were expressly mentioned herein. All the provisions of RA No. 9184 and its 2016 revised IRR, including the Generic Procurement Manual, and associated issuances, constitute the primary source for the terms and conditions of the Contract, and thus, applicable in contract implementation. Herein clauses shall serve as the secondary source for the terms and conditions of the Contract.

This is without prejudice to Sections 74.1 and 74.2 of the 2016 revised IRR of RA No. 9184 allowing the GPPB to amend the IRR, which shall be applied to all procurement activities, the advertisement, posting, or invitation of which were issued after the effectivity of the said amendment.

2. Sectional Completion of Works

If sectional completion is specified in the **Special Conditions of Contract (SCC)**, references in the Conditions of Contract to the Works, the Completion Date, and the Intended Completion Date shall apply to any Section of the Works (other than references to the Completion Date and Intended Completion Date for the whole of the Works).

3. Possession of Site

4.1. The Procuring Entity shall give possession of all or parts of the Site to the Contractor based on the schedule of delivery indicated in the **SCC,** which corresponds to the execution of the Works. If the Contractor suffers delay or incurs cost from failure on the part of the Procuring Entity to give possession in accordance with the terms of this clause, the Procuring Entity's Representative shall give the Contractor a Contract Time Extension and certify such sum as fair to cover the cost incurred, which sum shall be paid by Procuring Entity.

4.2. If possession of a portion is not given by the above date, the Procuring Entity will be deemed to have delayed the start of the relevant activities. The resulting adjustments in contract time to address such delay may be addressed through contract extension provided under Annex "E" of the 2016 revised IRR of RA No. 9184.

4. The Contractor's Obligations

The Contractor shall employ the key personnel named in the Schedule of Key Personnel indicating their designation, in accordance with **ITB** Clause 10.3 and specified in the **BDS**, to carry out the supervision of the Works.

The Procuring Entity will approve any proposed replacement of key personnel only if their relevant qualifications and abilities are equal to or better than those of the personnel listed in the Schedule.

5. Performance Security

5.1. Within ten (10) calendar days from receipt of the Notice of Award from the Procuring Entity but in no case later than the signing of the contract by both parties, the successful Bidder shall furnish the performance security in any of the forms prescribed in Section 39 of the 2016 revised IRR.

5.2. The Contractor, by entering into the Contract with the Procuring Entity, acknowledges the right of the Procuring Entity to institute action pursuant to RA No. 3688 against any subcontractor be they an individual, firm, partnership, corporation, or association supplying the Contractor with labor, materials and/or equipment for the performance of this Contract.

6. Site Investigation Reports

The Contractor, in preparing the Bid, shall rely on any Site Investigation Reports referred to in the **SCC** supplemented by any information obtained by the Contractor.

7. Warranty

7.1. In case the Contractor fails to undertake the repair works under Section 62.2.2 of the 2016 revised IRR, the Procuring Entity shall forfeit its performance security, subject its property(ies) to attachment or garnishment proceedings, and perpetually disqualify it from participating in any public bidding. All payables of the GOP in his favor shall be offset to recover the costs.

7.2. The warranty against Structural Defects/Failures, except that occasioned-on force majeure, shall cover the period from the date of issuance of the Certificate of Final Acceptance by the Procuring Entity. Specific duration of the warranty is found in the **SCC**.

8. Liability of the Contractor

Subject to additional provisions, if any, set forth in the **SCC**, the Contractor's liability under this Contract shall be as provided by the laws of the Republic of the Philippines.

If the Contractor is a joint venture, all partners to the joint venture shall be jointly and severally liable to the Procuring Entity.

9. Termination for Other Causes

Contract termination shall be initiated in case it is determined *prima facie* by the Procuring Entity that the Contractor has engaged, before, or during the implementation of the contract, in unlawful deeds and behaviors relative to contract acquisition and implementation, such as, but not limited to corrupt, fraudulent, collusive, coercive, and obstructive practices as stated in **ITB** Clause 4.

10. Dayworks

Subject to the guidelines on Variation Order in Annex "E" of the 2016 revised IRR of RA No. 9184, and if applicable as indicated in the **SCC**, the Dayworks rates in the Contractor's Bid shall be used for small additional amounts of work only when the Procuring Entity's Representative has given written instructions in advance for additional work to be paid for in that way.

11. Program of Work

11.1. The Contractor shall submit to the Procuring Entity's Representative for approval the said Program of Work showing the general methods, arrangements, order, and timing for all the activities in the Works. The submissions of the Program of Work are indicated in the **SCC.**

11.2. The Contractor shall submit to the Procuring Entity's Representative for approval an updated Program of Work at intervals no longer than the period stated in the **SCC.** If the Contractor does not submit an updated Program of Work within this period, the Procuring Entity's Representative may withhold the amount stated in the **SCC** from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program of Work has been submitted.

12. Instructions, Inspections and Audits

The Contractor shall permit the GOP or the Procuring Entity to inspect the Contractor's accounts and records relating to the performance of the Contractor and to have them audited by auditors of the GOP or the Procuring Entity, as may be required.

13. Advance Payment

The Procuring Entity shall, upon a written request of the Contractor which shall be submitted as a Contract document, make an advance payment to the Contractor in an amount not exceeding fifteen percent (15%) of the total contract price, to be made in lump sum, or at the most two installments according to a schedule specified in the **SCC**, subject to the requirements in Annex "E" of the 2016 revised IRR of RA No. 9184.

14. Progress Payments

The Contractor may submit a request for payment for Work accomplished. Such requests for payment shall be verified and certified by the Procuring Entity's Representative/Project Engineer. Except as otherwise stipulated in the **SCC**, materials and equipment delivered on the site but not completely put in place shall not be included for payment.

15. Operating and Maintenance Manuals

15.1. If required, the Contractor will provide "as built" Drawings and/or operating and maintenance manuals as specified in the **SCC.**

15.2. If the Contractor does not provide the Drawings and/or manuals by the dates stated above, or they do not receive the Procuring Entity's Representative's approval, the Procuring Entity's Representative may withhold the amount stated in the **SCC** from payments due to the Contractor.

Section V.

Special Conditions of Contract

Special Conditions of Contract

GCC Clause	
2	Section Completion: ***None***
4.1	The **Procuring Entity** shall give possession of all parts of the Site to the Contractor upon commencement of the project.
6	Site Investigation Report **None**
7.2	Permanent structures: Fifteen (15) years Buildings of types 4 and 5 as classified under the National Building Code of the Philippines and other structures made of steel, iron, or concrete which comply with relevant structural codes (e.g., DPWH Standard Specifications), such as, but not limited to, steel/concrete bridges, flyovers, aircraft movement areas, ports, dams, tunnels, filtration and treatment plants, sewerage systems, power plants, transmission and communication towers, railway system, and other similar permanent structures *[In case of semi-permanent structures, such as buildings of types 1, 2, and 3 as classified under the National Building Code of the Philippines, concrete/asphalt roads, concrete river control, drainage, irrigation lined canals, river landing, deep wells, rock causeway, pedestrian overpass, and other similar semi-permanent structures:]* Five (5) years. *[In case of other structures, such as bailey and wooden bridges, shallow wells, spring developments, and other similar structures:]* Two (2) years
10	No dayworks are applicable to the contract.
11.1	The Contractor shall submit the Program of Work to the Procuring Entity's Representative within _____*]* days of delivery of the Notice of Award.
11.2	The amount to be withheld for late submission of an updated Program of Work is _____.
13	No advance payment or mobilization be extended or paid in accordance with DOTr Memorandum dated 10 July 2018.
14	No further instructions.
15	The date by which operating and maintenance manuals are required is _____.
15.2	The amount to be withheld for failing to produce "as built" drawings and/or operating and maintenance manuals by the date required is _____.

Section VI.

Standard/Technical Specifications

General Conditions:

These specifications cover the requirements for the construction/completion of the subject project mentioned above. It shall supplement the plans and shall govern over the plans in case of conflict.

All drawings are intended to cooperate with the specifications to form part thereof. When figures are given, they are to be followed in the preference to measurements by scale. Anything in the drawings but not mentioned in the specifications or vice versa or anything not expressly set forth in either but which is reasonably implied shall be furnished as though specifically shown and mentioned in both.

The work of the contractor stipulated in the contract includes the furnishing of labor, materials, tools, equipment and supervision necessary to complete all phases of work in accordance with the plans and specifications.

All phases of work stipulated hereunder will be done in good workmanship to the satisfaction of the owner or his duly authorized representative determined during the progress of work or before the acceptance date. The construction work in this project includes all preliminary works related to the preparation of the construction site, safety devices, construction and cleaning of the site as required in the contract.

SAFETY

During the course of survey and clearing, any obstacles which are recognized and seemed to be explosive or hazardous to workers shall be removed from the site by the proper Authority.

At the end of each day's work, the Contractor shall keep the workplace in safe condition, so that no part is in danger of falling or creating hazard to personnel or equipment.

ITEM 741 - INTERLOCKING PRECASTCONCRETE BLOCKS

741.1 Description

This work item shall consist of constructing/installing Interlocking Precast Concrete Blocks for paving and for the protection of coastal areas and riverbeds, in conformity with the lines, grades and dimensions shown in the plans and specifications.
The works will involve incidental excavation/trimming and embankment build-up; slope stabilization and installation of appropriate Interlocking Precast Concrete Blocks; Precast Concrete Paving Blocks for paving works; and, Articulated Precast Concrete Blocks for protection of coastal areas and riverbeds.

741.2 Material Requirements

741.2.1 Interlocking Precast Concrete Blocks

741.2.1.1 Concrete Paving Blocks

Concrete paving blocks shall be free from defects that would interfere in the interlocking property or impair the strength or performance of the units, individually or as a whole. It shall conform to ASTM C 936M, Standard Specification for Interlocking Concrete PavingUnits.

Aggregates for concrete paving blocks shall be either lightweight or normal weight or a mixture of both. It shall be lifted and placed with one hand, and have an exposed face area of less than or equal to 0.065 m2 with an aspect ratio (length divided by thickness) of less than or equal to 4.

A thickness of 60mm shall be given to concrete paving blocks laid along and over pedestrian areas and driveways while 80 mm for areas under constant vehicular traffic. Samples tested using ASTM C 418, Standard Test Methods for Abrasion Resistance of Concrete by Sandblasting shall have a volume loss of not more than 15 cm3 / 50 cm2 and average thickness loss shall not exceed 3mm. The average absorption shall not be less than or equal to 5%, with individual unit of no greater than 7%. The length or width of concrete paving blocks shall not differ by more than + 1.6 mm from approved samples. Heights of units shall not differ more than +3.2 mm from the specified standard dimension.

741.2.1.2 Articulated Concrete Blocks

Articulated concrete blocks shall conform to the requirements of ASTM 0 6684, Standard Specification for Materials and Manufacture of Articulated Concrete Block (ACB) Revetment Systems

Table 1 Physical Requirements

Minimum Compressive Strength, Mpa		Maximum Water Absorption, kg./m3		Minimum Density (in air), Kg/m3	
Average of 3 units	Individual Unit	Average of 3 units	Individual Unit	Average of 3 units	Individual Unit
28	24	146	187	2082	2002

Width, height and length of articulated concrete blocks shall not differ by more than +3.2 mm from the specified standard dimension.

Interlocking articulated concrete blocks for coastal and riverbank protection shall be open-cell type having a void rate of approximately 15% to 17% to allow re-vegetation.

The articulated concrete blocks, considering proper installation and well compacted subgrade, shall maintain hydraulic stability of approximately 6.10 m/s under high velocity of flow, with corresponding bed shear stressesof 1.44 kN/m2 to 1.92 kN/m2•

741.2.2 Aggregate Base Material

Aggregate base materials shall conform to the applicable requirements of Item 703, Aggregates.

741.2.3 Bedding sand

Bedding sand shall be clean, washed natural or manufactured sand which conforms to ASTMC 33M, Standard Specificationfor ConcreteAggregates.

741.2.4 Joint sand

Joint sand shall conform to ASTM C 144, Standard Specification for Aggregate for Masonry Mortar.

741.2.5 Edge Restraints

Edge restraints are a key part of interlocking concrete paving blocks. By providing lateral resistance to loads, they maintain continuity and interlock among the paving blocks. For pedestrian areas and driveways, edge restraints shall be steel, aluminum, timber, troweled (hidden) concrete curb or plastic edging specifically designed for concrete paving blocks. Formed or precast concrete restraints are required for streets, parking lots and roads.

741.2.6 Geotextile

Geotextile shall conform to the applicable requirements of Item 715, Geotextiles.

741.2.7 Revetment Cable

Cable shall be made of high tenacity and low elongated wires that exhibit good to excellent resistance to most concentrated acids, alkalis and solvents. It shall be impervious to rot, mildew and degradation associated with marine organisms with high resistance to deterioration for long period of fresh/saltwater immersion.

Revetment cable shall be selected so that the cable and all connections result in a minimum factor-of-safety of 5.0 with respect to lifting.

741.2.8 Anchors

Anchors shall be provided to fix blocks on the slope. These are usually reinforced concrete, one (1) meter in length, inserted through its centrally disposed holes at certain interval. GI pipe filled with concrete, reinforced by steel bars may be used as alternative. Installation shall be in accordance with the specifications shown on the Plan.

741.2.8.1 Reinforced Concrete Anchor

Concrete shall be Class B as specified in Item 405, Structural Concrete. Reinforcing material shall be Deformed Billet-Steel Bars for Concrete Reinforcement as specified in Item 710, Reinforcing Steel and Wire Rope.

741.2.9 Vegetation

Vegetation shall be a choice of vetiver grass or any equivalent deep-rooting species planted on each gap of interlocking blocks to complement its anti-erosion function. Vetiver grass shall conform to the applicable requirements of Item 622, Coconet Bio-EngineeringSolutions.

741.3 Construction Requirements

741.3.1 Concrete Paving Blocks

Compaction of subgrade shall be at least 98% of standard Proctor density as specified in ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m3). However, modified Proctor density (ASTM D 1557, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/m3» is preferred, especially for areas under constant vehiculartraffic.

In moist or wet areas, and where the soil is expansive, geotextile shall be installed toseparate the soil from the aggregate base.

Bases for pedestrian areas and residential driveways shall be compacted a minimum 98% of standard Proctor density. For vehicular areas, compaction shall be at least 98% of modified Proctor density as determined by ASTM D 1557, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/m3).

Variation in final base surface elevations shall not exceed +10 mm when tested with a 3 m straightedge.

Edge restraints shall be set at the correct level, especially if the tops of the restraints are used for screeding the bedding sand. Their elevations shall be checked prior to placing the sand and concrete paving blocks. Edge restraints are typically installed before the bedding sand and paving blocks are laid.

The sand shall be spread evenly over the base course and screeded to a nominal 25 mm thickness, not exceeding 40 mm thickness. After the sand is screeded, it shall not be disturbed.

Concrete paving blocks shall be installed in accordance with patterns shown on the drawings. Typical joints between the paving concrete blocks shall be between 2 mm to 5 mm wide on average. Cut concrete paving blocks shall be used to fill gaps along the edge of the pavement. Gaps less than 10 mm shall be filled with sand or filled by shifting courses of concrete paving blocks.

After a substantial area of concrete paving blocks have been placed, the concrete paving blocks shall be compacted into the sand using a vibrating plate compactor which is capable of exerting a minimum of 22 kN of centrifugal compaction force and operate at 75-90 hertz. Simultaneously, dry joint sand is swept into the joints and the paving blocks shall be compacted again until the joints are full.

Final surface elevations shall not vary more than + 10 mm under a 3 m straightedge, unless otherwise specified. The top of the concrete paving blocks shall be 3 to 10 mm above adjacent catch basins, utility covers, or drain channels. The top of the installed concrete paving blocks shall be 3 to 6 mm above the final elevations to compensate for possible minor settling. Sealersor joint sand stabilizers shall be applied if needed.

741.3.2 Artiallated Conaete Blocks

The subgrade shall be well-compacted; and, free of voids, pits and depressions. Obstructions such as roots and projecting stones larger than 2.5 cm left visible on the

surface, shall be removed. Soft or low density pockets of material removed shall be filled with embankment material and compacted up to the desired minimum proctor density.

The base foundation shall be designed considering actual site conditions and slope stability analysis Is considered. Base footing shall be made from interlocking block layers, assembled horizontally on the riverbed from the toe of the embankment extended down to a specified length towards the river centerline, interconnected using revetment cable. The length may vary, depending on the computed value from scour analysis. The construction shall proceed after graded foundation bed is fully covered with geotextile.

The foundation bed shall also be prepared by providing excavation at the base of the slope and thereby, the initial layer of assembled blocks shall be positioned 1-meter below the riverbed line. The excavated area shall follow the designed embankment H:V ratio from the baseline up to the desired excavation depth. Upon the preliminary block installation, excavated trench shall be backfilled with soil and compacted to a minimum required compaction ratio.

Other forms of interlocking articulated concrete block foundation shall be made of construction materials such as gabion, boulder fill, and reinforced concrete provided that the design and construction method will produce the same effect to what is specified in this Item.

Areas where geotextile and interlocking articulated concrete blocks are to be placed shall be laid parallel to the lines and grades as specified in the Plans. Prior to articulated concrete block installation, geotextile shall be placed and anchored on a smooth graded surface approved by the Engineer. The geotextile shall be placed in such a manner that placement of the overlying materials will not excessively stretch or tear the geotextile. Coverage area for geotextile shall be equal to the computed slope area subject for block installation.

Interlocking articulated concrete blocks shall be placed within the limits as described on the Plans. The blocks shall be well-fastened to prevent vertical or horizontal displacement. No more than 61 linear meter of geotextile shall be laid before covered with interlocking blocks. Geotextile installed more than two (2) days not covered by blocks shall be lifted and the surface of the slope shall be inspectedfor slope defects.

The interlocking articulated concrete blocks shall be installed in the field by the use revetment cables. These cables shall be extended up to a required length. Anchors shall be provided to fix blocks on the slope. These are usually installed at 2-meter interval upon placing the blocks with cable. Anchor depth may vary depending on the computed length as required from the conducted slope stability analysis.

Gaps noticed after the block-laying shall be filled with topsoil, grass and fertilizer in accordance with the Plans and Specifications. Grass shall conform to the applicable requirements of Item 622, Coconet Bio-Engineering Solutions. Prior to grass planting, the block's surface shall be inspected for damage. Individual blocks with noticeable cracks resulting to a reduced individual block weight of 1/3 shall be replaced.

741.4 sampling and Testing

Sampling and Testing for Interlocking Concrete Blocks shall conform to ASTM C 140M, Sampling and Testing Concrete Masonry Units and RelatedUnits.

741.5 Delivery,Storage and Handling

Materials delivered to the site shall be inspected for damage, unloaded and stored atleast through proper handling. The Contractor shall designate storage site ready for use before the materials are delivered. Avoid leaving the delivered materials placed unattended on the ground where probable contact and/or exposure to dirt and debris may occur. Materials shall be so handled with utmost care to ensure undamaged condition upon delivery.

741.6 Method of Measurement

The quantity to be paid for under this item shall be the number of square meter unit comprising the areas shown in the plans where the Interlocking PrecastConcrete Blockswill be laid and shall be determined by direct measurementsof the actual dimensions

41.7 Basis of Payment

The quantity as determined in Section 741.6 shall be paid for at unit price stipulated in the Contract's Bill of Quantities. The payment shall constitute the full compensation for furnishing all the necessary materials, providing necessary equipment and tools in installing the appropriate Interlocking Precast Blocks, labor cost and all the incidental expenses necessary to complete the work.

Payment will be made under:

Pay Item Number	Description	Unit of Measurement
741 (1)	Concrete Paving Blocks	Square Meter
741 (2)	Articulated Concrete Blocks	Square Meter

References:

1. DPWH Standard Specifications for Highways, Bridges and Airports (Volume II)

2. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
C 936M - Standard Specification for Interlocking Concrete Paving Units
C 33M - Specification for Concrete Aggregates
C 144 - Standard Specification for Aggregate for Masonry Mortar
C 140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related
C 418 - Standard Test Method for Abrasion Resistance of Concrete by Sandblasting
D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft:3(6QO kN-m/m3)}
O 1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft:3 (2,700 kN-m/m3)}
D 6684 - Standard Specification for Materials and Manufacture of Articulating Concrete Block (ACB) Revetment Systems

3. Hydraulic Stability of Articulated Concrete Block Revetment Systems during Overtopping Flow
(FHWA-RD-89-199)

4. Cocogreen Interlocking Blocks

S. Internet

http://www.resourcebuildingmaterials.com/products/SpecData_UnitPavers02780.pdf
https://www.shawbrick.ca/files/documents/3945_Pave

ROAD STUDS

Technical Specs

LED:	6 pieces (3 by two sides) High intensity emitting diode
LED Color:	White / Red / Yellow / Blue/ Green
Flash Type:	Steady (1Hz~200Hz Adjustable)
LED Brightness:	5,000mcd / one side
Dimension:	Upper Parts - 137(Ø) x 6(H) mm/ on The Ground
	Low Parts - 125(Ø) x 39(H) mm/ cylindrical parts
Weight:	750g / unit
Compression Load:	About 320 000 N (32Ton)
Storage / Type:	LiFePo4 (Lithium Ion) Battery 3.2 V / 1000 mA/hPCM(Protection Circuit Module)
SOLAR CELL / Max.output:	4V

SCOPE:

Concrete Boring at every 3 meters

Adhesive pouring

Road Stud installation

Section 15 - DEMOLITION AND REMOVAL

SECTION 15 – DEMOLITION AND REMOVAL

15.01 SCOPE

The work includes the furnishing of all labor, materials and equipment required to carry out the demolition and removal of obstructions, portions of existing piers including extraction/cutting of timber and R.C piles at required depth and demolition of miscellaneous buildings, pavements, fences, utilities, navigation aids and wrecks etc., as required for the execution of the Contract.

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

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

For off-shore obstruction to pile driving and dredging, survey shall be executed by the Contractor with the Engineer before any demolition and removal of wrecks is commenced and shall be as directed by the Engineer.

15.02 INTERFERENCE WITH PORT OPERATIONS

During the execution of the work, the Contractor shall not interfere with the shipping, navigation and other traffic in the port.

The Contractor shall make arrangements with the operations people on the schedule of demolition and related works to keep port operation activities undisturbed at all times.

Prior to commencement of the demolition works, the Contractor shall inform/announce to port users the schedule of disconnection of utilities.

05.03 EXECUTION

1.) Prior to the commencement of demolition works, the alignments of the new construction works to existing pier shall be checked.

2.) The width and alignment of portion of existing structure to be demolished shall be marked by paint.

3.) With these lines as guides, concrete shall be broken and reinforcing bars cut, such that panels or portions of the structure can be lifted out for disposal elsewhere outside of the operational work area.

4.) Extract concrete piles with care in order not to damage existing or adjacent structures, equipment or materials.

5.) Piles (timber/concrete) for demolition/extraction shall be done with care and/or to the required level indicated in the plan as shown in the drawings.

6.) Rocks removed from existing slope protection shall be stored for re-use in new construction.

7.) Demolish buildings, pavements, curbs, fences, utilities, services, navigation aids and the like as determined in the field for each project and as shown on the drawings or as directed by the Engineer.

8.) Materials coming from the demolish works shall be properly disposed by the Contractor.

15.04 SAFETY

During the course of survey and clearing, any obstacles which are recognized and seemed to be explosive or hazardous to workers shall be removed from the site by the proper Authority.

At the end of each day's work, the Contractor shall keep the workplace in safe condition, so that no part is in danger of falling or creating hazard to personnel or equipment.

SECTION II. BASE PREPARATION

Base preparation – filling materials shall be in accordance with the specifications and in conformity with the lanes, grades and dimensions shown on the plans or established by the Engineer.

The placing and compaction of approved materials within the area where unsuitable materials has been removed and the placing and compacting of filling materials in holes, pits and other depressions within the area.

Filling materials and backfills shall contain no muck, peat, sod, roots and other deleterious matter, broken concrete and other solid. Bulky materials shall not be placed in the area where filling is to be placed or compacted.

SECTION 21 – REINFORCED CONCRETE

All works falling under this category shall reinforced concrete for all kinds and parts of any reinforced concrete structure.

21.01 MATERIALS

a. Cement

Cement used shall be Type I Portland conforming to the requirements of the latest revision of ASTM C 150 "Standard Specifications for Portland Cement".

b. Coarse Aggregates

Coarse Aggregates shall be washed, well graded, hard pieces of gravel, crushed gravel or rock conforming to the requirements of ASTM C 33 "Standard Specification for Concrete Aggregates".

c. Fine Aggregates

Fine Aggregates shall be washed sand, stone screenings or other inert materials of same characteristics, or any combination thereof composed clean, hard, strong, uncoated grains and free from injurious amount of dust, lumps of clay, shale, alkali, and organic matter. It shall conform to the requirements of ASTM C33 "Standard Specifications for Concrete Aggregates". Beach sand shall not be used unless approved by the Engineer.

d. Admixtures

Unless otherwise required by field conditions admixtures may be used subject to the expressed approval of the Engineer. The cost thereof shall be considered as already included in the unit cost bid of the Contractor for the concrete.

21.02 STORAGE OF MATERIALS

a. Cement shall be stockpiled as closely as possible in weatherproof storage sheds, stacks suitably elevated above ground to prevent cement absorption of moisture

b. Aggregates shall be placed in stockpile in a manner preventing segregation thereof and contamination with foreign materials.

c. Reinforcing steel bars shall be stored properly, covered and protected from humidity to prevent rusting and contamination with oil, dirt or other objectionable matters.

21.03 DESIGNED STRENGTH OF CONCRETE

Concrete for structural parts of members such as bearing piles or columns shall develop a minimum 28-day compressive cylinder strength of 4,500 psi., and for deck or floor slabs, beams and girders of the structure shall develop a minimum 28-day compressive cylinder strength of 3,500 psi., unless otherwise indicated in the drawings.

Concrete for non-structural parts or members such as partition walls and slab on fill shall develop a minimum 28-day cylinder strength of 3,000 psi., unless otherwise indicated in the drawings.

21.04 TRIAL BATCH FOR CONCRETE

Thirty (30) calendar days before the start of concreting works, the Contractor shall submit design mixes and the corresponding test result made on sample thereof. Sampling and testing shall be in accordance with the ASTM Standard procedures for sampling and testing, for the particular design strength(s) required.

The particulars of the mix such as the slump and the proportionate weights of cement, saturated surface dry aggregates and water used shall be stated. Test results shall show 28-day strength(s) fifteen (15%) percent higher than the ultimate strength(s) required.

The design mix for concrete to be used shall be submitted together with at least three (3) standard cylinder samples for approval at least one (1) month prior to the start of each concreting schedule. Such samples shall be prepared in the presence of the Engineer.

Standard laboratory strength tests for the 7, 14, and 28 days period shall be taken to all concrete samples in addition to routine fields tests, at cost to the Contractor. Only design mixes represented by test proving the required strength for 7, 14, and 28 days test shall be allowed.

The cost of sampling, handling and transporting samples from jobsite to the laboratory and the cost of subsequent tests made until the desired mix is attained shall be for the account of the Contractor.

21.05 CONCRETE PROPORTION AND CONSISTENCY

Concrete proportion should produce mix consistencies that will work readily into angles and corners of the forms and around reinforcements irrespective of the method of placing employed, without permitting the materials to segregate or excess water to collect on the surface of the concrete and with separated individual particles of aggregates showing coating of mortar with proportionate amount of sand. The total aggregate in the proportion used shall be such that when sieved, the weight passing the No.4 standard sieve shall be thirty percent (30%) of the total.

The methods used for measuring materials going into the concrete mix shall permit easy checking and control of proportions at any time during the work.

21.07 MIXING OF CONCRETE

All concrete used be machine-mixed at the site. Each batch shall be mixed at the mixer's design speed, for at least 1-1/2 minutes after all concrete materials are simultaneously placed in the mixer. The ideal rotation speed of the mixer shall be between 14 and 20 rpm.

All mix contents of the mixer shall be thoroughly removed before any succeeding batch is placed.

The materials for the first batch shall contain sufficiency excess cement, sand and water to coat the inside walls of the mixer without reducing the required mortar content of the mix.

The mixer shall be provided with devices for accurately measuring and controlling the amount of water used in each batch and for automatically recording the number of revolutions of the mixer.

Hand mixing of concrete will only be allowed in case of mixer breakdown, in which a case it shall be stopped as soon as pouring for the particular section is completed, or at a construction joint as directed by the Engineer.

Re-tempering or re-mixing of partially hardened concrete with the addition of water will not be permitted.

21.08 PLACING OF CONCRETE

1. Concrete shall be place in the presence of the Engineer only after the forms, reinforcing bars and other spaces to receive the concrete have been inspected and approved by him.

2. Concrete shall be placed only when wind and weather conditions will allow proper placement and curing of the concrete. Notice of any concreting operations shall be served to the Engineer at least three (3) days ahead of each schedule.

3. Mixed concrete shall be deposited in its final position within a practicable time. Each succeeding fresh deposit for particular structural member shall be placed at a practicable rate to prevent cold joints. Each successive fresh deposit of concrete shall be vibrated vertically at uniformly spaced points and levels, of such duration and intensity to compact the concrete thoroughly but shall be discontinued the moment segregation of materials is noticed.

4. Where concreting operations involve a fall more than 1.50meters (4.92 feet), the fresh concrete shall be poured through approved sheet metal conduit or pipes. The pipes shall be kept full of concrete and its lower end kept below the surface of concrete throughout the pouring operations.

5. Deposition of concrete shall be in such a way as to prevent segregation of the materials and the displacement of the reinforcement. Placing shall be done preferably with the use of buggies, buckets or wheel-borrows. Troughs, conveyors and pipes and the manner of use of each one shall be with the expressed permission of the Engineer.

6. Each layer of concrete shall be placed approximately normal as possible in uniform layers not exceeding 3.30 meter, unless otherwise ordered. The rate of placing concrete in the forms shall preferably be 0.025 meter (0.082 feet) vertical rise per minute.

21.09 CONSTRUCTION JOINT

During stoppage of concrete pouring operations, when jointing of old concrete becomes necessary, the following point should be observe:

1. Construction joint not indicated in the drawings shall be located as to least affect the strength of the structure. Such locations will be as pointed out by the Engineer.

21.10 FORMS AND FALSEWORK

All forms and falsework to be used in the work must be designed, and constructed by the Contractor for rigidity and adequacy for carrying the loads of the fresh concrete and/or additional superimposed construction loads. The authority may from time to time verify the adequacy and safety such temporary works and may require the Contractor to submit detailed designed drawings of forms and falseworks proposed to be used. Approval of such drawings or design of forms, however, shall not relieve the Contractor of his liability on resulting imperfections or damages to be finished concrete or other damages which may directly result there from.

Forms may be re-used but shall be scrapped by a wire brush of all clinging mortar. Bulges should be planed and realigned prior to its use.

Prior to placing concrete from surfaces should be oiled for easy form removal. However, the oil coating should not be so thick as to stain and soften the concrete surface. Oil coatings should be applied before rebars are placed.

21.11 CURING AND WATERPROOFING

All concrete shall be cured for at least 14 days after the date of placing in accordance with the approved and accepted methods.

21.12 FINISHING OF CONCRETE SURFACES

Concrete surfaces shall conform accurately to the form, alignment, grades and sections shown in the drawings or as prescribed by the Engineer. It shall be free from bulges, ridges, honeycombing or roughness of any kind, and shall be of a reasonably smooth wood float finish.

21.13 TREATMENT OF SURFACE DEFECTS

All irregular concrete surfaces, voids, holes, honeycombs exposed after removal shall be repaired by the Contractor in such a way that the repaired surface will be acceptable under paragraph 21.12 above.

21.14 ARCHITECTURAL FINISH

All exposed concrete exterior surfaces shall be given an architectural finish as directed by the Engineer.

21.15 PLACING OF REINFORCEMENT

Metal reinforcement shall be placed as accurately detailed on drawings and properly secured by approved means.

All bars shall be cold bent unless approved otherwise by the Engineer. Minimum distance between parallel bars shall be one and one half (1 1/2) times the diameter for round bars and twice the side dimension for square bars. The clear distance between bars shall not be less than 2.54 cm. (1 in.) nor less that one and one third (1 1/3) times the maximum size of the coarse aggregate, whichever is bigger.

All reinforcing steel shall be cleaned of all rust or scale and deleterious materials which tend to destroy the bond between the concrete and the steel.

21.16 REINFORCING BAR SPLICES

Generally, splice/s of reinforcements of points of maximum stress especially in slabs, beams and girders shall be avoided. Such splice/s may however be approved by the Engineer in writing provided the lap if bonded or butt welded is sufficient to transfer tensile stress between bars by at least 125% of the specified yield strength of the reinforcing bar. For adjacent bars splices shall be staggered.

21.17 READY-MIXED CONCRETE

Where ready-mixed concrete is used, the requirements specified for batching, mixing and transporting shall be in accordance with the requirements set forth in ASTM C94 Specifications for Ready-Mixed Concrete unless otherwise specified.

1. The Contractor shall notify the Engineer seven (7) days in advanced before any continuous phase of concreting operations is started. Upon notification, the Engineer shall have the right to inspect the ready-mixed concrete supplier's plant/equipment and all materials and/or sources thereof. The Contractor must coordinate with the supplier and must provide safe and adequate guidance for the Engineer or his representative in conducting such examinations.

2. For all ready-mixed concrete delivered to site of work, discharge shall be completed within one hour after the addition of cement to the aggregates or before the drum is revolved 25 times, whichever comes first. Under conditions contributing to the stiffening of concrete especially during hot weather, the time required between the introduction of cement to the aggregates and discharge of the mix may still be reduced by the Engineer.

3. Truck mixers shall be equipped with counters indicating the number of revolutions of the drums which shall be automatically actuated at the time of starting mixers at mixing speed.

4. Each batch or truck delivery of concrete shall be mixed inside the drum for not less than 70 revolutions of the drum at the rate of rotation designated by the equipment manufacturer. Additional mixing if ordered by the Engineer shall be at the speed designated as agitating speed by the manufacturer of the equipment.

5. Concrete for individual batches or deliveries should be of uniform consistency, mix and grading. If slump tests of a minimum 2 samples taken within 15 minutes of each other at approximately 15% and 85% discharge load give values differing more than 2.54 cm. (1 in.) when the specified slump is 76 mm. (3 in.), use of the particular mixer in the work shall be stopped until corrections are made to prevent such conditions, which shall be confirmed by further slump test.

6. Every batch or ready-mixed concrete delivered at the job site shall be accompanied by a ticket furnished in accordance with Section 15 of ASTM 94.The time when the materials were batched shall also be indicated.

7. Non-agitating equipment or combination truck and trailer equipment for transporting concrete will not be permitted.

8. The Authority reserves the right to verify from time to time the quality and quantity of materials used in every cement batch from the batching plant. The Contractor shall be aware of this provision and make the proper arrangement with the concrete supplier.

21.18 TEST ON CONCRETE

Test on concrete shall be in accordance with the following:

a. Concrete samples for tests shall be secured and molded in accordance with ASTM C172 "Method of sampling Concrete", and ASTM C31– "Method of making Curing, Concrete Compression and Flexure Test specimens in the field".

b. Strength test on samples shall be made in accordance with ASTM C39-"Standard Method of Test for Compressive Strength of Molded Concrete Cylinder".

Not less than four (4) cylindrical specimens shall be made for each test of which at least two (2) shall be reserved for 28-day test. Not less than one (1) test shall be made for every fifty (50) cubic meters of concrete but in no case less than one (1) test for each day's concreting.

Samples shall be taken by the Contractor under close supervision of the Engineer; and shall be delivered as soon as practicable for testing, at his expense, to the designated laboratories.

The average strength of test samples representing any definite class of concrete used as well as the average of any five (5) consecutive strength tests representing the class of concrete shall be equal to or greater than the specified strength and not more than one (1) strength test in ten (10) shall have an average values less than 90% of the specified strength.

If the test results indicate strength values less than the required, the Project Manager shall have the right to order a change in the concrete proportion used for the remaining work, or in the procedure of curing the concrete.

21.19 LIQUIDATED DAMAGES (Specific)

For failure to meet the specified strength required for concrete, designed, prepared and laid by him, the Contractor shall pay the AUTHORITY a liquidated damages, not as penalty or forfeiture the following, to be applied only to the quantity of concrete which the particular sample/s represent.

1. Payment of 30 percent contract unit cost per cubic meter of concrete affected, for test resulting to strength between 90 to 100 percent of specified strength;
2. Payment of 50 percent contract unit cost per cubic meter of concrete affected, for test resulting to strength between 80 to 90 percent of that specified strength;
3. Non-payment and removal and replacement at cost to the Contractor of all concrete affected for resulting to strengths below 80 percent of that specified, all in accordance with ACI-318, and at cost to the Contractor.

21.20 FIELD TESTS

Field test as may be deemed necessary to check on the quantity of the materials and mixtures and the manner of construction employed shall be conducted by the Project Engineer assigned to the project. And when such tests result to values less than that tolerated by standards set in applicable provisions of the ASTM Specifications referred to herein, or contrary to accepted good Engineering practice, the Contractor shall comply to any instructions given by the Project Engineer to upgrade the materials used and method of construction employed.

Section 35 – CONCRETE WORKS

35.01 SCOPE OF WORK

The work shall include all labor, materials equipment, plant and other facilities for the satisfactory performance of all works necessary to complete all concrete and reinforced concreted work shown on the Drawing and specified herein.

35.02 MATERIALS

a. Cement - Cement used shall be Type I Portland Cement conforming to the requirements of the latest revision of ASTM C 150 “Standard Specifications for Portland Cement”.

b. Coarse Aggregates - Coarse Aggregates shall be washed, well graded, hard pieces of gravel, crushed gravel, rock or other approved inner materials of similar characteristics, or combination thereof, having hard, strong, durable pieces and free from any adherent coatings. It shall conform to the requirements of ASTM C 33 “Standard Specification for Concrete Aggregates”.

c. Fine Aggregates

Fine Aggregates shall be washed sand, stone screenings or other inert materials with similar characteristics, or any combination thereof having clean, hard, strong, and durable particles, uncoated grains and free from injurious amount of dust, lumps of clay, shale, alkali, and organic matter approved by the Engineer. It shall conform to the requirements of ASTM C33 “Standard Specifications for Concrete Aggregates”. Beach sand shall not be used unless approved by the Engineer. Fine aggregates from different sources of supply shall not be mixed or stored in the same pile nor used alternately in the same class of concrete without the approval of the Engineer.

d) Admixtures – Air-entraining admixtures shall conform to the requirements of AASHTO M154.Chemical admixtures, if specified or permitted, shall conform to the requirements of AASHTO M194. Unless otherwise required by field conditions admixtures may be used subject to the expressed approval of the Engineer. The cost thereof shall be considered as already included in the unit cost bid of the Contractor for the concrete.

e) Water – Water used in mixing, curing and other designated application shall be reasonably clean and free of oil, salt, acid, alkali or other substance which would adversely affect the concrete. Water will be tested in accordance with, and shall meet the suggested requirements of ASSHTO T26.

f. Reinforcing Bars – It shall be standard commercial deformed steel bars and must conform to the requirements of ASTM A 615, grade 40 and/or ASSHTO M42, M31 and M53.

g. Tie Wire – It shall be commercial G.I wires, gauge 16 and must be in accordance with ASTM A 615 and/or ASSHTO M31 and M42.

h. Forms – It shall be of well-seasoned, quality lumber and well-graded plywood. All forms shall be straight, free from warps and of adequate strength to resist distortion. Formwork shall be coated with form oil of approved make.

i. Storage of Materials – Cement shall be stored on weatherproof building or watertight shed, and on platform off ground. The Contractor shall handle and store fine and coarse aggregates separately in a manner to provide good drainage, and to prevent segregation or inclusion of foreign materials. All reinforcing bars shall be protected from mechanical injury and surface deterioration caused by exposure to conditions producing rust until used.

35.03 TRIAL BATCH FOR CONCRETE

Thirty (30) calendar days before the start of concreting works, the Contractor shall submit design mixes and the corresponding test result made on sample thereof. Sampling and testing shall be in accordance with the ASTM Standard procedures for sampling and testing, for the particular design strength(s) required.

The particulars of the mix such as the slump and the proportionate weights of cement, saturated surface dry aggregates and water used shall be stated. Test results shall show 28-day strength(s) fifteen (15) percent higher than the ultimate strength(s) required.

35.04 CONCRETE PROPORTION AND CONSISTENCY

Concrete proportion should produce mix consistencies that will work readily into angles and corners of the forms and around reinforcements irrespective of the method of placing employed, without permitting the materials to segregate or excess water to collect on the surface of the concrete and with separated individual particles of aggregates showing coating of mortar with proportionate amount of sand. The total aggregate in the proportion used shall be such that when sieved, the weight passing the No.4 standard sieve shall be thirty percent (30%) of the total.

The methods used for measuring materials going into the concrete mix shall permit easy checking and control of proportions at any time during the work.

35.05 MIXING OF CONCRETE

All concrete used be machine-mixed at the site. Each batch shall be mixed at the mixer's design speed, for at least 1-1/2 minutes after all concrete materials are simultaneously placed in the mixer. The ideal rotation speed of the mixer shall be between 14 and 20 rpm.

All mix contents of the mixer shall be thoroughly removed before any succeeding batch is placed.

The materials for the first batch shall contain sufficiency excess cement, sand and water to coat the inside walls of the mixer without reducing the required mortar content of the mix.

The mixer shall be provided with devices for accurately measuring and controlling the amount of water used in each batch and for automatically recording the number of revolutions of the mixer.

Hand mixing of concrete will only be allowed in case of mixer breakdown, in which a case it shall be stopped as soon as pouring for the particular section is completed, or at a construction joint as directed by the Engineer.

Re-tempering or re-mixing of partially hardened concrete with the addition of water will not be permitted.

Inserts, sleeves, anchors, blots and all other materials in connection with concrete construction shall be placed and secured in position before concrete is placed.

35.06 JOINTS

No reinforcement, corner protection angles or other fixed metal items shall be run continuous through joints containing expansion- joint filler, through crack- control joints in slabs on grade and vertical surfaces.

Joints with Joint Sealant: At expansion joints in concrete slabs to be exposed, and at other joints indicated to receive joint sealant, pre-molded expansion joint filler strips shall be installed at the proper level below the elevation with a slightly tampered, dressed and wood strip temporarily secured to the

top thereof to form a groove, when surface dry, shall be cleaned of foreign matter, loosed particles, and concrete protrusions, there filled approximately flush with joint sealant so as to be slightly concave after drying.

Finish of concrete at joints: Edges of exposed concrete slabs along expansion joints shall be nearly finished with a slightly rounded edging tools.

Construction Joints: Unless otherwise specified herein, all construction joints shall be subject to the approval of the Owner. Concrete shall be placed continuously so that the unit will be monolithic in construction. Fresh concrete may be placed against adjoining units, provided the set concrete is sufficiently hard to be injured thereby. Joints not indicated shall be made and located in a manner not to impair strength and appearance of the structure.

Placement of concrete shall be at such rate that surfaces of concrete not carried to joint levels will not have attained initial set before additional concrete is placed thereon. Lifts shall terminate at such levels as indicated or as to conform to structural requirements as directed. If horizontal construction joints are required, a strip of 254 mm square-edge lumber, leveled to facilitate removal shall be taken to the inside of the forms at the construction joints. Concrete shall be placed to a pint 25 mm above the underside of the strip. The strip shall be removed 1 hour after the concrete has been, any irregularities in the joint lines shall be leveled off with a wood float, and all laitance removed. Prior to placing additional concrete, horizontal constructed joints shall be prepared as specified in “Bonding”.

35.07 FORMS AND FALSEWORK

All forms and falsework to be used in the work must be designed, and constructed by the Contractor for rigidity and adequacy for carrying the loads of the fresh concrete and/or additional superimposed construction loads. The authority may from time to time verify the adequacy and safety such temporary works and may require the Contractor to submit detailed designed drawings of forms and falseworks proposed to be used. Approval of such drawings or design of forms, however, shall not relieve the Contractor of his liability on resulting imperfections or damages to be finished concrete or other damages which may directly result there from.

Forms may be re-used but shall be scrapped by a wire brush of all clinging mortar. Bulges should be planed and realigned prior to its use.

Prior to placing concrete from surfaces should be oiled for easy form removal. However, the oil coating should not be so thick as to stain and soften the concrete surface. Oil coatings should be applied before rebars are placed.

35.08 PLACING REINFORCEMENT

Metal reinforcement shall be placed as accurately detailed on drawings and properly secured by approved means.

All bars shall be cold bent unless approved otherwise by the Engineer. Minimum distance between parallel bars shall be one and one half (1 1/2) times the diameter for round bars and twice the side dimension for square bars. The clear distance between bars shall not be less than 2.54 cm. (1 in.) nor less that one and one third (1 1/3) times the maximum size of the coarse aggregate, whichever is bigger.

All reinforcing steel shall be cleaned of all rust or scale and deleterious materials which tend to destroy the bond between the concrete and the steel.

Generally, splice/s of reinforcement at points of maximum stress especially in slabs, beams and girders shall be avoided. Such splice/s may however be approved by the Engineer in writing provided the lap if bonded or butt welded is sufficient to transfer tensile stress between bars by at least 125% of the specified yield strength of the reinforcing bar. For adjacent bars splices shall be staggered.

35.09 PLACING CONCRETE

Concrete shall be handled from mixer to transport to place of final deposit in a continuous manner, as rapidly as practicable, and without segregation or loss of ingredient until the approved unit of work is completed. Placing will not be permitted when the sun, heat wind or, limitations of facilities furnished by the Contractor prevent proper finishing and curing of the concrete. Concrete shall be placed in the forms, as closed as possible in the final position, in uniform approximately horizontal layers not over 30 mm deep. Forms splashed with concrete and reinforcement splashed with concrete of form coating shall be cleaned in advance of placing subsequent lifts. Concrete shall not be allowed to drop freely more than 10 meters in unexposed work nor shall more than 1 meter in exposed work; where greater drops are required, tremie or other approved means be employed. The discharge of the tremies shall be controlled so that the concrete may be effectively compacted into horizontal layers not more than 300 mm thick, and the spacing of the tremies shall be such that segregation does not occur. Concrete to receive other construction shall be screeded to the proper level to avoid excessive skimming or grouting. Conduits and pipes shall not be embedded in concrete unless specifically indicated or as directed by the Owner.

Time Interval between Mixing and Placing: Concrete mixed in stationary mixers and transported by non-agitating equipment shall be placed in the forms within 45 minutes from time to time ingredients are charged into the mixing drum. Concrete transported in truck mixers or truck agitators shall be delivered to the site of work discharge in the forms within 45 minutes from time to time that the ingredients are discharge into the mixing drum. Concrete shall be placed in the forms within 45 minutes after discharge from the mixer at the jobsite.

Earth-foundation placement: Leveling concrete for concrete foundations, exterior slabs and exterior foundations receiving equipment or machinery shall be placed upon undisturbed surfaces. The surfaces shall be clean and free from mud and water. The concrete foundations may be placed over the leveling concrete surfaces.

Conveying Concrete by Chute, Conveyor or Pump: Concrete may be conveyed by chute, conveyor, or pump if approved in writing. In requesting approval, the contractor shall submit his entire plan of operation from time of discharge of concrete from the mixer to final placement in the forms, and steps to be taken to prevent the formation of cold joints, in case the transporting of concrete by chute, conveyor or pump is disrupted. Conveyor and pump shall be capable of expeditiously placing concrete at the rate most advantageous requiring changes in the concrete materials or design mix for efficient operation.

a. Chutes and Conveyors: chutes shall be of steel or steel line wood, rounded in cross section rigid in construction, and protected from overflow. Conveyors shall be designed and operated and chute sections shall be set, to assure a uniform flow of concrete from mixer to final place of deposit without segregation of ingredients loss of mortar, or change in slump. The discharge portion of each chute or conveyor shall be provided with advice to prevent segregation. The chute and conveyor shall be thoroughly cleaned before and after each run. Waste material and flushing water shall be discharge outside the forms. When using titled chutes, the inclination should not be flatter than one (1) vertical and (2) horizontal. From the outlet/mouth of the chute to the concrete surface, the maximum allowable height shall be 1.50 meters.

b. Pumps shall be operated and maintained so that a continuous stream of concrete is delivered into the forms without air pocket, segregation of change in slump. When pumping is completed, concrete remaining in the pipeline shall be ejected, wasted without contamination of concrete already placed.

After each operation, equipment shall be thoroughly cleaned and the flushing water shall be splashed outside the forms.

Placing concrete reinforcement: Where congestion of the steel or other conditions will make placing or compaction of concrete difficult, a layer of mortar shall be first deposited in forms to a depth of approximately 25 cm. Mortar proportions shall be the same as the concrete minus the coarse aggregate.

35.10 COMPACTIOIN

Immediately after placing, each layer of concrete shall be compacted by internal concrete vibrators supplemented by land spading, rodding, and tamping or other external vibration of forms will not be permitted unless specifically approved by the Owner. Vibrators shall not be used to transport concrete inside forms. Internal vibrators submerged in concrete shall maintain a speed of not less than 7000 impulses per minute. The vibrating equipment shall at all times be adequate in number of units and power to properly consolidate all concrete.

Spare units shall be on hand as necessary to insure such adequacy. Duration of vibrating equipment shall be limited to time necessary to produce satisfactory consolidation without causing objectionable segregation. The vibrators shall not be inserted into lower courses that have begun to set.

Vibrators shall be applied at uniformity spaced points not further apart than the visible effectiveness of the machine.

35.11 BONDING

Bonding/depositing new concrete on or against concrete that has set. The surfaces of the set concrete shall be thoroughly cleaned sop as to expose the coarse aggregates and be free of laitance, coatings, foreign matter and loose particles. Forms shall be retightened. The cleaned surfaces shall be moistened, but shall be without free flowing water when concrete is placed.

35.13 FINISHES OF CONCRETE

Within 12 hours after forms are removed, surface defects shall be remedied as specified herein. Fine and loose material shall be removed.

Honeycomb, aggregate pockets voids over 13 mm in diameter, and holes left by the rods or bolts shall be cut out to solid concrete, reamed, thoroughly wetted, brush-coated with neat cement grout, and filled with mortar. Mortar shall be a stiff mix of 1 part Portland cement to not more

2 parts fine aggregates passing the no.16 mesh sieve, and minimum amount of water. The color of the mortar shall match the adjoining concrete color. Mortar shall be thoroughly compacted in place.

Holes passing through walls shall be completely filled from the inside face by forcing mortar through to the outside face. Holes which do not pass entirely through wall shall be packed full.

Patchwork shall be finished to match adjoining Ambient temperature shall not be less than 10 degrees C. Dusting of finish surfaces with dry material or adding water to concrete surfaces will not be permitted.

Smooth Finish: After the above operations have been completed, smooth finish shall be given to interior and exterior concrete surfaces that are to be painted or exposed to view. Smooth finished shall consist of thoroughly wetting and then brush-coating the surfaces with cement grout composed by volume of 1 part fine aggregate passing the no. 30 m mesh sieve and mix water to the consistence of thick mixes, so that the final color of grout when dry, will be approximately the same as the color of the surrounding concrete. Grout shall be cork or wood-damp by means of fog spray during the setting period. The finish of any area shall be completed in the same day and the limits of a finished area shall be made at natural breaks in the finished surface.

Rough Slab Finish: Slabs to receive full and mortar setting beds shall be screeded with straight-edges to bring the surface to the required finish plane with no aggregate visible.

Broom Finish shall be given to exterior except concrete stairs treads, entrances, and landings for buildings. The concrete shall be screeded and floated to the required finish level with no coarse aggregate visible. After the surface moisture has disappeared and laitance has been removed, surfaces shall be still toweled to an even, smooth finish. The toweled surfaces shall be broomed with a fiber bristled in a direction transverse to that of the main traffic.

35.16 CURING

Concrete shall be protected against moisture loss, rapid temperature change, mechanical injury from a rain or flowing water, for a minimum period of 7 days.

Concrete shall be maintained in a most condition at temperature above 10 degrees C throughout the specified curing period and until remedied work started. Curing activities shall be started as soon as fever water has disappeared from the surface of the concrete after placing and finishing.

Form under surface shall be moist cured with forms in place for the full curing period or, if forms are removed prior to the end of the curing period by other approved means. Curing shall be accomplished by any of the following methods of combination thereof, as approved.

Water: Water used in curing shall be reasonably cleaned and free of oil, salt. acid. alkali or other substances injurious to the concrete. Drinking water may be used for curing test.

Moist Curing: Uniformed surfaces shall be covered with burlap or mats, wetted before placing and over-lap at least 150 mm. Burlap or mats shall be kept continually wet and in intimate contact with the surface. If the forms are removed before the end of the curing period, curing shall be continued on uniformed surfaces, using suitable materials.

35.17 LIQUIDATED DAMAGES (Specific)

For failure to meet the specified strength required for concrete, designed, prepared and laid by him, the Contractor shall pay the AUTHORITY a liquidated damages, not as penalty or forfeiture the following, to be applied only to the quantity of concrete which the particular sample/s represent.

a. Payment of 30 % contract unit cost per cubic meter of concrete affected for test resulting to strength between 90 to 100 percent of specified strength;

b. Payment of 50 % contract unit cost per cubic meter of concrete affected for test resulting to strength between 80 to 90 percent of that specified strength;

c. Non-payment and removal and replacement at cost to the Contractor of all concrete affected for resulting to strengths below 80 percent of that specified; provide that;

To determine the adequacy of the affected pavement or structure the General Manger may order load tests on parts of the pavements/structure where concrete strength is below 80% of that specified, all in accordance with ACI-318, and at cost to the Contractor.

35.18 FIELD TESTS

Field test as may be deemed necessary to check on the quantity of the materials and mixtures and the manner of construction employed shall be conducted by the Project Engineer assigned to the project. And when such tests result to values less than that tolerated by standards set in applicable provisions of the ASTM Specifications referred to herein, or contrary to accepted good Engineering practice, the Contractor shall comply to any instructions given by the Project Engineer to upgrade the materials used and method of construction employed.

STANDARD PROCEDURES AND REQUIREMENTS FOR TAKING PHOTOGRAPHS, PER PPA ENGINEERING MEMO CIRCULAR NO. 001-2005

1. The points where the photographs are to be taken shall be designed by the Project Engineer/ Project Representative.
2. Each item of works for the project must be photographed before, during and after the completion of the item
3. Photographs shall be taken with a person holding a signboard indicating the station and date.
4. Photographs shall be taken on the same points at the same angle before, during and after the completion of the particular item of work. The “during” photographs shall include equipment being used.
5. The photographs shall be colored and at least 4” by 6”.
6. The photographs shall be properly labeled indicating the item of work, the stage of construction (i.e. before, during, after) the name of the photographer and the front initialed by the Project Engineer concerned.

CLEAN-UP & DISPOSAL OF WASTE

The contractor shall be responsible for the general cleaning and disposing of all tools, surplus materials and equipment used in the execution of the work. As part of the demobilization cost, the Contractor shall furnish the owner the required as-built drawings as indicated in the General Conditions.

NOTE: Any of the aforementioned items of works not in conformity with the plans and specifications are subjected for replacement/repair at the expense of the Contractor.

AS - BUILT PLAN

Upon completion of the project, the contractor shall submit and file with owner a complete mark-up print of the as-built plan including electrical system layout as actually installed in AUTO CAD form for the owner’s future reference.

Section VII.

Drawings

(To be issued manually)