



Republic of the Philippines
Tourism Infrastructure & Enterprise Zone Authority

PROJECT SPECIFICATIONS

I. GENERAL CONDITIONS

The work to be undertaken shall include the furnishing of labor, materials, tools and equipment for the project **INSTALLATION OF SAFETY MECHANISM/STRUCTURE AT MALINTA TUNNEL** located at **CORREGIDOR ISLAND**.

A. Scope of Work

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

1. General Requirement
2. Protective Canopy/Enclosure
3. Hauling of Materials (Double Handling)
4. Other items or works as maybe required by plans and related contract documents necessary to satisfactorily complete the project

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

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

II. SITE WORKS

A. Scope of Work

Furnish all materials and equipment and perform labor required for the disposal of surplus excavated materials, rubbish and debris resulting from site clearing, stripping, site grading and trenching, demolition, removal and foundation excavation.

B. Clearing the Site

The building site shall be leveled according to the plans and cleared of rubbish, roots and other perishable and objectionable matters to a suitable sub-grade.

Surplus materials not required or suitable for fill or backfill and all debris and other materials resulting from demolition work shall be immediately removed from the site premises by the contractor and be disposed off in areas provided by the contractor. Debris and rubbish shall be removed and transported in a manner that will prevent spillage on streets or adjacent areas. In cases of spillage, clean up the streets and adjacent areas that were affected.

C. Staking out the Building Lines

The building lines shall be staked out and all the lines and grades shown in the drawing established before any excavation is started. Batter boards and reference marks shall be erected at place where they will not be disturbed during the excavation. Construct two permanent benchmarks of previously known elevations near the site of construction.

III. EARTHWORKS

A. Scope of Work

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

B. Excavation

1. Structural Excavation

- a. Structural excavation shall be to the grade, whichever, is lower. The indicated depth is the minimum requirement for excavation. In case suitable bearing materials are encountered at elevations other than those specified or shown on the drawings, the Engineer at his discretions may direct in writing the excavations above or below those indicated on the drawings.
- b. No extra excavations shall be done without the written approval of the Engineer. In no case shall footings rest on fill.
- c. All structural excavations shall be inspected and approved by the Engineer before pouring any concrete, laying underground services or placing backfill materials.
- d. All structural excavations shall extend to a sufficient distance from walls and footings to allow the proper erection and dismantling of forms, installation of service lines and for inspection.
- e. Control the grading in the vicinity of all excavated areas to prevent surfaces drainage running into excavations. Remove accumulated water in excavated area by pumping or by other approved methods.

2. Excavation for drainage structures

Excavation for drainage structure shall be made accurately to the lines, grades and elevations shown or as directed. Dimension and elevation of footings and foundation excavations shown are only approximate and may be changed if necessary to assure adequate foundation support. Trenches and foundation pits shall be of sufficient size to permit the placement and removal of forms for the full length width of structural footings and foundations as shown. Rock or other hard foundation material shall be cleaned of loose debris and cut to a firm surface, either level, stepped or serrated, as shown, or as direct loose disintegrated rock and thin strata shall be removed. When concrete is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade shall not be made until just before the concrete is to be placed.

3. Shoring

- a. Excavation shall be shored and braced by members of suitable sizes where necessary to prevent danger to persons, injury or erosions.
- b. Shoring, bracing and sheeting shall be removed as the excavations are backfilled in a manner such as to prevent injurious caving.

C. Backfilling

- a. All fillings shall be placed on layers not exceeding four (4) inches in thickness each layer being thoroughly wetted and compacted by approved machine or hand tampered to a density of optimum moisture as determined by the modified ASSHTO T 180, Method D. All compaction tests shall be at the expense of the Contractor.
- b. No footing shall rest on fill and the soil bearing capacity shall not be less than 3000 psf.
- c. After forms have been removed from the footings and piers, the materials from excavation shall be used for backfilling ground. All trash wood chips and other debris shall be removed from areas to be backfilled. The filling shall be made in layers not exceeding 4" thick, each layer thoroughly tamped.
- d. No backfill shall be placed against walls or other vertical surfaces until they have been inspected and backfilling is authorized.
- e. Any excess material resulting from the finish grading operations not required or unsuitable for fill or backfill, shall be disposed by the contractor at his expense.

IV. CONCRETE WORKS

A. Scope of Work

1. This includes all labor, materials, equipment and incidentals necessary for the construction of all concrete work including reinforcing steels, forms, water stops and miscellaneous related items such as walls, shelves, anchor bolts and embedded items. Placing and finishing of concrete shall be in accordance with this specification and conforming to the lines, grades and dimensions shown on the approved plans. Concrete

shall consist of a mixture of Portland cement, fine aggregates, coarse aggregates, and water.

B. General Provisions

1. Minimum concrete strength $f'c$ is 3,000 psi.
2. No hand mixing shall be allowed, except in case of emergency such as mixer breakdown during pouring operations and shall stop at the first allowed construction joints. All concrete shall be machine mixed for at least 1-1/2 minutes after all materials including water are in the mixing drum.
3. The mixer shall be of an approved size and type which will ensure a uniform distribution of material throughout the mass. It shall be equipped with a DEVICE FOR ACCURATELY MEASURING AND CONTROLLING THE AMOUNT OF MIXING WATER IN EACH BATCH.
4. Placing of material in mixer shall be done in such a way that first batch of concrete materials placed in the mixer shall contain sufficient excess of cement, sand and water to coat the inside of the drum without reducing the cement content of the mix to be discharged.
5. Re-tempering of concrete shall not be allowed.
6. All testing shall comply with the latest applicable ASTM Test Methods (ASTM Standard). Samples of aggregate and concrete as placed will be subjected in the work shall conform to the approved samples.

C. Materials

1. Cement shall be Portland Cement of a brand approved by the Project Engineer and conforming to ASTM C150, Type I or Type II.
2. Aggregates

Fine aggregate shall be washed with natural sand conforming to ASTM Standard and shall range in size within the following limits of US Standard Sieve sizes.

Sieve Designation	Percent (%) Passing
No. 4	95-100
No. 8	80-100
No. 16	45-70

Maximum Silt Content – 2%

Coarse Aggregate shall be well-graded, crushed stone or washed gravel conforming to ASTM Standard having the following maximum size:

25mm – for plain concrete
20mm – for reinforced concrete sections
19mm – for concrete piles

Maximum Silt Content – 1%

3. Water shall be potable, clean, and free from deleterious amounts of acids, alkalis, oils or organic matter. Seawater must not be used.
4. Admixtures for ready-mixed concrete

An approved water reducing aspect conforming to ASTM Standard, Type A or D, shall be used and shall entrain 3.0 to 5.0 percent air in the resultant concrete. Proportioning and mixing shall be as recommended by the manufacturer.

D. Quality of Concrete

1. The actual development of mix proportions composed of Portland cement, Admixtures, Aggregates and water to produce concrete which conforms to the specific requirements shall be determined by means of prior laboratory tests performed by the contractor with the approved constituents to be used in the work.
2. Proportioning

Well in advance of placing any concrete the contractor shall discuss with the Project Engineer the source of materials and concrete mixture proposes to use. Representative samples of aggregate and cement and their test results shall be furnished to the Project Engineer. A pouring permit signed by the Project Engineer should be presented by the contractor prior to pouring of concrete.

The contractor shall allow ample time to develop a proposed design mix or to modify the proposed design mix within the limits of these specifications whenever in the opinion of the Engineer it becomes or desirable.

Consistency of the concrete as measured by the requirements of ASTM Standard shall be as shown in Table B below:

Table B

TYPE OF STRUCTURE	SLUMP (mm) RECOMMENDED	RANGE
Pavement and slabs on ground	50	28-75
Heavy reinforced foundation walls & footing	50-75	50-100
Plain footings, gravity walls, slabs & beams	50-75	25-100
Thin reinforced walls & columns	75	75-100

3. No excessive wet concrete will be permitted. Concrete delivered to the site having slump in excess of that specified in Table B will be rejected.
4. The temperature of the concrete at the time of placement shall normally be 30 degrees centigrade. The contractor will be responsible for employing whatever measures are necessary to comply with these temperature requirements.

5. Formworks

The contractor shall design, furnish and install all formworks and supports required to confine the concrete and shape it to the lines shown as the drawings. Form design shall conform to ACI 347. Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete and shall be sufficiently tight to prevent loss of mortar from the concrete.

Forms shall be made of either steel or new approved lumber and shall be free from roughness and imperfections.

6. Placing of Concrete

No concrete shall be placed until the forms, reinforcement steel, pipes, conduits, sleeves, anchors and other embedded items have been inspected and approved by the Project Engineer.

Pipes, conduits, dowels and other ferrous items required to be embedded in concrete construction shall be positioned and supported prior to placement of concrete such that there will be a minimum of 50mm clearance between said items and any part of the concrete reinforcement. Securing such items in position by wiring or welding it to reinforcement will not be permitted.

Before depositing any concrete, all debris, dirt and water shall be removed from the forms. The surfaces of previously placed concrete, such as horizontal or vertical construction joints, shall be roughened, cleaned from foreign matter and laitance to expose a fresh face and saturated with water at least two hours before and again shortly before the new concrete is placed. Immediately before the new concrete is placed, all hardened surfaces shall receive thorough coating of next cement slurry mixed to consistency of very thick paste at least 50mm thick which shall first be well scrubbed-in by means of stiff bristle brushes. The new concrete then shall be placed before the next cement sets up.

Concrete shall be uniformly placed as near as possible to its final location in the forms. The placing of concrete in forms shall not exceed 0.60m vertical rise per hour.

7. Curing and Protection

- a. It is the latest of those specifications to obtain properly cured concrete. The basic requirement of proper curing is to maintain continuous moist surface from the time of placing the concrete until the end of the curing period. The use of curing compounds may be acceptable but shall require prior approval in writing by the Project Engineer.
- b. All exposed surfaces including finished surfaces shall be treated immediately after concrete has been poured to provide continuous moist curing for at least 7 days. Walls and vertical surfaces may be covered with continuously saturated burlap or kept moist by other approved means.
- c. Formed surfaces shall be thoroughly soaked with water at least twice a day until the forms are removed.

8. Removal of Forms

- a. The contractor shall not remove any forms for at least 48 hours or until the concrete has attained a strength of at least 30% of the ultimate strength.
- b. Forms for beams and slabs shall not be stripped for at least 150-day degrees and supports shall not be removed until the concrete has attained at least 60% of the specified 28-day strength and is capable of safely supporting its own weight. Construction live loads shall not be placed until concrete has attained its specified 29-day strength – 3000 psi (20.68 MPa).
- c. Forms shall be stripped such that they will not damage the concrete.

E. Concrete Reinforcements

1. Scope of Work

This includes the furnishing, fabrication and installation of all steel bars and steel tie wires, clips, supports, chairs and spaces required for the reinforcement of concrete as shown on the drawings and/or specified herein.

2. Standard Specifications

- a. All reinforcing steel bars shall be 40,000 psi Intermediate Grade unless otherwise specified.
- b. The following standards are required to:

ASTM A 82	Cold drawn steel wire fabric for concrete reinforcements
ASTM A 497	Welded deformed steel wire fabric for concrete reinforcements
ASTM A 615	Deformed billet steel bars for concrete reinforcements
ASTM A 315	Manual of standard practice for detailing reinforce concrete structures

3. Shop Drawings

- a. The contractor shall submit three (3) sets of completely detailed working drawings and schedules of all reinforcement for review to the Project Engineer. The bending diagrams and bar lists shall be detailed in accordance with ACI 315.
- b. Fabrication of steel reinforcement steel shall not proceed until the construction joint locations and the shop drawings have been reviewed by the Project Engineer.

4. Substitutions

- a. The following reinforcing steel bar sizes shall be used for reinforced concrete design:

Nominal Diameter (mm)	Approx. Cross Section Area (sq. mm)	Approx. Unit Wt (kg/m)
#10	78	0.616
#12	113	0.888
#16	201	1.579
#20	314	2.466
#25	492	3.854
#28	615	4.833

- b. Should the contractor wish to use reinforcing steel bars having areas different from those shown, all proposed changes shall be submitted to the Project Engineer for approval.

5. Products

a. Materials

Reinforcement steel shall be deformed, new billet steel bars conforming to ASTM A 615, grade 40 for 10mm to 28mm diameter bars, substantially free from mill, scale, rust, grease or other foreign matters.

Rail steel bars will not be permitted in the work.

Reinforcement steel shall bear a mill identification symbol, and shall be tagged with the size and mark number so that different types may be identified and shall be stored off the ground to protect the steel moisture and dirt, until placed in final position.

Steel wire for tying reinforcing bars and water stops shall conform to ASTM A 82. Welded wire fabric for concrete reinforcement shall conform to 5ASTM A 497.

6. Fabrication of Reinforcement

- a. Reinforcement steel shall be accurately formed to the dimensions shown on the shop drawings and bar schedules.
- b. All reinforcing bars shall be bend cold around a pin with a free revolving collar having a diameter proportional to the diameter of the bar of not less than the following:
 - Two to stirrups
 - Six times for bars up to and including 25mm diameter
 - Eight times for bars over 25mm diameter
- c. Reinforcement steel shall not be straightened nor re-bent. Bars with kinks or bends not shown on the drawings will be accepted

7. Installation of Reinforcement

- a. Reinforcement bars shall be accurately placed as shown on the drawings, and in accordance with the shop drawings and schedules. The reinforcing bars shall be secured against displacement with annealed iron wire ties of minimum 1.5mm diameter or suitable clips at the intersection.
- b. Except as otherwise indicated on the drawings, reinforcement steel shall be installed with a clearance for concrete cover as follows:

Concrete placed directly on earth	75mm
Formed surfaces in contact with the soil, water or exposed to weather	50mm
Concrete cover of main reinforcement for columns and beams	50mm
All other slab surfaces	25mm

- c. No reinforcing bars shall be welded.

V. MASONRY WORKS

A. Scope of Work

1. This includes the furnishing of all labor, materials, equipment required to construct all concrete masonry unit walls as shown on the drawings and as specified herein.
2. The work under this section shall include but not be limited to the following:
 - a. Concrete hollow blocks
 - b. Masonry reinforcing bars for concrete blocks
 - c. Grouting
 - d. Connecting wall anchors, ties, bolts and related embedded items

B. Standard Specification

1. The following standards are referred to:

ASTM C33	Concrete Aggregates
ASTM C90	Hollow Load-Bearing Concrete Masonry Units
ASTM C144	Aggregate for Masonry Mortar
ASTM C150	Portland Cement
SAO #15-2	Standardization of Concrete Hollow Blocks

C. Protection of Materials

1. All materials for the work of this section shall be delivered, stored and handled so as to preclude damage of any nature.

D. Materials

1. Cement

Portland cement shall conform to ASTM Specification C150, Type I.

2. Sand for Mortar

Sand shall be clean, durable particles, free from injurious amounts of organic matter. The sand shall conform to ASTM specification C144 or C33 as required.

3. Water

Water shall be free from injurious amounts of oils, acids, alkalis, organic matter, and shall be clean and fresh.

4. Concrete Hollow Blocks (CHB)

Concrete block shall conform to ASTM C90, Grade N, and/or to the Phil. Bureau of Standards SAD No. 15-2.

E. Mortar Mixes

1. Masonry mortar for setting blocks shall be in the proportion of one part cement to 3 parts sand or as otherwise approved by the Project Engineer. Mortars shall be mixed with water in an amount compatible with workability.
2. Mixing shall be done immediately before usage.

F. Execution

1. All masonry shall be laid plumb and true to lines and built to the thickness and bond required with courses level and joints and bond uniform. Masonry shall be carried up in a uniform manner.
2. Concrete blocks shall be laid in running bond, unless otherwise indicated with joints not exceeding 10mm and uniform throughout and finished slightly concave and smooth. All blocks shall be laid in a full bed of mortar applied to shell and webs.
3. All necessary block cutting shall be neatly done by saws.
4. Control joints shall be installed at the locations noted and detailed on the drawings.

G. Lintels, Ties and Miscellaneous Items

1. The contractor shall build in all miscellaneous items specified in other sections to be set in masonry including frames, lintels, reinforcing steel, electrical boxes and fixtures, sleeves, grilles, anchors and other miscellaneous items. All anchorage, attachments, and bonding devices shall be set so as to prevent slippage and shall be completely covered with mortar.

VI. CARPENTRY WORKS

A. Scope of Work

1. Furnish materials and equipment and perform labor required to complete wooden framings and related rough carpentry works as indicated in the plans and/or specified herein.
2. Include in the works nailing strips, scaffoldings, plates, straps, joists, hangers, rods, dowels, rough hardware, fasteners, and other miscellaneous iron and steel items pertinent to rough carpentry work.

B. Materials

1. Lumber shall be of approved quality of the respective kinds required for the various parts of the work, well seasoned, thoroughly dry, straight and free from large, loose or unsound knob, sap shakes or other imperfections impairing its strength, durability or appearance.
2. Framing lumber shall be of rough dimensions shown on drawings.
3. All exposed woodwork shall be smoothly dressed and well sand papered.
4. Moisture content shall not exceed 18% unless otherwise specified.
5. All lumber, excluding scaffoldings, are to be pressure treated, conforming to 67% stress grade lumber in accordance to the requirements of the Phil. National Building Code, latest edition.
6. Fastening shall be common nails, glue as specified flat head wood screws, round head wood screws, bolts or log screws where specifically called for.
7. Conceal fastenings as far as possible, where not possible, locate them in inconspicuous place, where nailing is permitted through woodwork face conceal nail heads.

C. Substitution of Lumber

1. Any lumber equally good for the purpose intended may be substituted for kinds specified provided however, that the substitution be authorized in writing by the Project Engineer.

D. Rough Hardware and Metal Fasteners

1. Plates, straps, nails, spikes, bolts, joists, hangers, rods, dowels, fasteners and miscellaneous iron and steel items shall be of sizes and types to rigidly secure member in place.

VII. STEEL WORKS

A. Scope of Work

1. Furnish all materials and equipment and perform labor and services required to complete fabrication and erection of all structural steel and other miscellaneous steel in accordance with the plans.


B. Materials

1. Structural steel shall conform to American Society of Testing Materials (ASTM) A-36, with F_y of 248 MPa.
2. Electrodes for welding shall conform to the latest requirements of the American Welding Society (AWS).
3. Use only approved brand of red lead paint and linseed oil for all shop painting for structural steel.

C. Execution

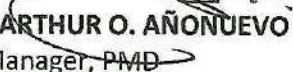
1. Tighten all bolts to a bolt tension not less than the proof load given in the applicable ASTM Specifications for the type of bolt used.
2. Never let compression members deviate from straightness by more than $1/100$ of the axial length between points which are to be laterally supported.
3. Let completed members free from twists, bends, and open joints. Sharp kinks or bends shall be the cause of rejection of materials.
4. Give all steelwork, except those to be encased in concrete, one coat of shop paint.
5. Make all work well formed to shape and size shown and assemble as detailed in the plans.
6. Weld or bolt connections as indicated in the plans. Make all details of assembly strong with sufficient stiffness. Form joints exposed to weather in a manner that excludes water.
7. Provide all work with proper clearances. Fabricate and install in a manner to provide for expansion and contraction but will ensure rigidity and provide close fitting of sections.
8. Provide a protective coating which is resistant to alkaline, mortar and plaster to be applied to all sections after fabrication.

Prepared By:



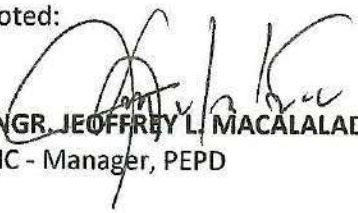
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