



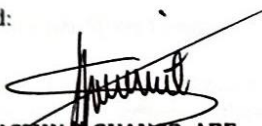
Republic of the Philippines
Department of Agriculture
Western Visayas
Iloilo City

REHABILITATION OF LIMA-LIMA DIVERSION DAM


Brgy. Lima-lima, Isabela, Negros Occidental

TECHNICAL SPECIFICATIONS

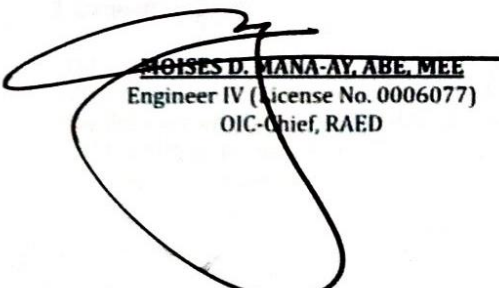
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A. GENERAL REQUIREMENT

1. Project Signboard and Billboard

Commission On Audit (COA) Billboard printed in white tarpaulin, 8ft x 8ft dimension; resolution 70 DPI; Font: Helvetica; Font Size: Main information – 3 inches; Sub. Information – 1 inch; and Font Color: Black.

Department of Agriculture (DA) Signboard/ Billboard shall be on a standard billboard measuring 1200mm x 2400mm (12ft x 8ft) using 12mm (1/2 inch) marine plywood. The said billboard shall be installed in front of the project site.

2. Project Marker

The project marker shall be made of concrete hollow blocks and reinforced steel bars, plastered finished and with concrete foundation underneath, marker information see on the approved plans/ drawings.

3. Temporary Facility

The Contractor shall furnish all materials, labor, equipment, tools and install such temporary works that are necessary for the successful completion of the Contract Work. The Contractor shall negotiate the site for his construction camp, office and work areas.

Temporary works shall conform to all government standards, safety and codes and shall meet the sanitary requirements of the Department of Health.

These temporary works and construction plant shall include but shall not be limited to the following:

- 1. Construction camp for housing, feeding and accommodation for all the Contractor’s employees.
- 2. Facilities such as haul roads, potable water, supply, drainage, lighting, sewage disposal system, sanitation, first aid and fire protection facilities.
- 3. All other temporary facilities not specifically listed but nevertheless required for the proper functioning of the camp set-up and construction activities.

4. Mobilization/ Demobilization

The Contractor shall mobilize and move into the Project Site the required construction equipment needed for the successful completion of the Contract Work.

MINIMUM EQUIPMENT REQUIREMENT FOR DIVERSION DAM

<u>Equipment</u>	<u>Quantity</u>
Concrete Mixer 1 bagger	1 unit

On the other hand, demobilization shall include dismantling and removal from the site of Contractor’s Construction Plant, materials, equipment and all temporary facilities with the exception of some facilities which the Project Engineer shall consider to remain and which shall be handled over to DA-RAED. The time of demobilization shall also include clean-up of the site after completion of the Contract Work.

B. DIVERSION DAM

1. Clearing, Lay-out & Staking

The work under this item shall consist of the removal, safety and proper disposal, in a manner approved by the Project Engineer, of all vegetation, trees, stumps, roots, brush, rubbish and all objectionable matters within the right-of-way for the Project Construction, all in accordance with the plans, drawings and specifications or as directed by the Project Engineer.

2. Demolition Work

This Item shall consist of the removal wholly or in part, and satisfactory disposal of all structures and any other obstructions which are not designated or permitted to remain, except for the obstructions to be removed and disposed off under other items in the Contract. It shall also include the salvaging of designated materials and backfilling the resulting trenches, holes, and pits. Basements or cavities left by the structure removal shall be filled with acceptable material to the level of the surrounding ground and, if within the prism of construction, shall be compacted to the required density.

3. Cofferdamming

The Contractor shall construct and maintain all necessary cofferdams, channels, drains, sumps and/or other temporary diversion and protective works; shall furnish all materials, labor and equipment required therefore; and furnish, install, maintain and operate all necessary pumping and other equipment for removal of water. After having served their purpose, all cofferdams or other protective works downstream from the dam shall be removed or level to give a slightly appearance, so as not to interfere in anyway in the operation or usefulness of the reservoir, and in a manner approved by DA-RAED.

The Contractor shall be responsible for and shall repair at his expense any damage to the foundations. Structures or any other part of works caused by floods, water or failures of any part of the diversion or protective works.

4. Excavation (Manual)

The work under this item shall consist of excavating, removal, hauling and disposal of all excavated materials; tamping and trimming foundation bed required for the construction of permanent structures with the use of suitable excavated materials as determined by the Engineer; hauling and disposing of all excess excavated materials to the designated waste disposal areas, all in accordance with the plans and specification or as ordered by the Engineer. It shall also include whenever necessary all coffer damming, temporary diversion and protection works, pumping and dewatering operations, all necessary draining, sheeting, shoring and clean-up site after construction.

5. Rock Excavation

5.1 Definition

'Rock' shall comprise of material found in ledges or masses in its original position or artificial material, which would normally have to be loosened either by blasting or by pneumatic tools, or if excavated by hand, by the continued use of wedges and sledge hammers and in the opinion of the Engineer is incapable of being loosened with a track-type tractor with mounted and drawn ripper of the following description:

a) Tractor Unit: Equipment with a minimum mass of 35 tonnes and net horse power rating of 300hp or 225kW or more. The tractor unit is to be in good condition and operated by experienced personnel.

b) Ripping Unit: The ripper to be attached to the tractor shall be the most efficient parallelogram type recommended by the tractor or ripper manufacturer. The ripper shall have a single shank in good class condition with a sharpened cutting point. Solid rock shall be regarded as:

- a) Only solid boulders or detached pieces of rock exceeding one (1) cubic metre in volume
- b) Material not less than 20MPa of unconfined compressive strength (UCS)
- c) Production rate of less than fifty (50) cubic metres per hour for continuous of four (4) hour using 300hp excavator or ripper at full capacity.

Rock in trench or pit shall not include material which, in the judgement of the Engineer, can be excavated at a rate of four (4) cubic metres solid or more per hour by a 50hp backhoe in good order and efficiently operated.

5.2 Method of Working

- a. The Contractor shall adopt a method of working such that at any time, control perimeter blasting operations including the drilling of perimeter holes do not advance by more than one panel ahead of bulk blasting operations and more than two panels ahead of mucking operations to remove all blasted materials to the perimeter face, unless specially approved by the Engineer, in order that adjustments to drilling, charging and detonation can be made, appropriate to the conditions being encountered.
- b. The Engineer will only approve a variation to the above procedure subsequent to the Contractor demonstrating the success of his working procedure in relevant rock conditions through trial blasting.
- c. Mucking out to the perimeter faces shall be carried out carefully from the perimeter line. The final face shall be exposed and scaled in a continuous operation downwards as the last stage of the mucking out cycle. Scaling shall be carried out to remove from the face all loose material and rock fragments which move when pressed with a crowbar. The required scaling works shall be carried out using a high pressure jet or other means as appropriate.
- d. Approval to proceed with the blasting of a subsequent panel will only be given after scaling and any rock face stabilization measures, deemed by the Engineer to be required immediately to the final slope to ensure its long term stability, have been completed. Depending on the conditions encountered the

Engineer may require limited excavation either in the form of blasting (including sub-benching) or mucking out to be carried out to permit the installation of rock stabilization measures as directed by the Engineer.

- e. In certain sections of the works where the prevailing geological structure is likely to control the final face profile, the Engineer may waive the requirement for controlled perimeter excavation techniques provided that the Engineer is satisfied that other excavation equipment is capable of achieving a sound profile along a discontinuity without damage beyond that plane. In such cases, unless otherwise approved by the Engineer in writing, the main blasting adjacent to a final slope shall then be modified to include a four (4) meter wide buffer zone measured perpendicular from the final slope. The drill holes within the buffer zone shall not be larger than 50mm and the spacings, burdens (which shall not exceed the hole spacing), and charge per hole in the zone shall be suitably reduced to avoid excessive blast damage to the final face. No subgrade drilling shall be allowed in the holes above the berms.

Slopes of cuttings formed in rock are to be cleaned of all rock fragments which move when pressed with a crowbar.

Constructional traffic shall not use the surface of the bottom of a cutting unless the cutting is in rock or the Contractor maintains the level of the bottom surface at least 300mm above formation level. Any damage to the subgrade arising from such use of the surface shall be made good by the Contractor at his own expense with material having the same characteristics as the material which has been damaged. From the time the Contractor begins to trim the remaining material to formation level on any given area, the movement and use of constructional plant thereon other than that used to complete this operation shall be in accordance with the requirements.

6. Formworks

6.1 General

Forms shall be used whenever necessary to confine the concrete during vibration and to shape it to the required lines. Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete, and shall be maintained rigidly in position. The strength and rigidity of the forms shall be such that formed surfaces will conform to specification requirements relating to the surface irregularities and tolerances for concrete construction. Forms shall be securely tight to prevent loss of mortar from concrete.

Chamber strips shall be placed in the corners of the forms for exposed exterior corners so as to produce beveled edges. Interior corners and edges of formed joints shall not be beveled unless requirement thereof.

Stub walls shall not be used, except that stub walls shall be used for walls having fillets at the bottom. Concrete in such stub walls shall be re-vibrated after adjacent floor concrete is placed.

Sheathing of reset forms shall overlap the previous lift by not more than 1 inch. Forms shall be tightened against the concrete so that the forms will not spread and permit abrupt irregularities or loss of mortar or paste. Supplementary bolts or form ties shall be used as necessary to hold the reset forms against the concrete. Forms of all wall openings shall be constructed so as to facilitate loosening.

6.2 Form Sheathing and Lining

Wood sheathing or lining shall be of such kind and quality and shall be so treated or coated that there will be no chemical deterioration or discoloration of the formed concrete surfaces. The ability of forms to withstand distortion caused by placement and vibration of concrete shall be such that the formed surfaces will conform to applicable requirements of these specifications pertaining to finish formed surfaces.

Plywood used for sheathing or lining shall be high density overlaid plywood specially manufactured for use in construction concrete forms as approved.

The lumber shall be free from warp and knotholes and shall have no knots larger than 5cm in diameter. All knots shall be sound and tight. There will be no pitch pockets, barbs or lack of wood on the face of the lumber against the concrete is to be placed.

6.3 Form Ties

Embedded ties for holding forms shall remain embedded and, shall terminate within the concrete approximately two diameters or twice the minimum dimensions of the tie from the formed faces of the concrete, or as directed by the Project Engineer. The ties shall be so constructed that ends and end fasteners can be removed by unskilled workmen without causing spalls at the faces of the concrete.

6.4 Cleaning and Oiling of Forms

The surfaces of the forms in contact with the concrete shall be free from encrustations of mortar, grout or other foreign materials when the concrete is placed. The surfaces of the forms to be in contact with the concrete shall be coated with an approved coating which will enable the ready release of the forms and will not contaminate the concrete surfaces. Except as provided below, forms for surfaces which are to be painted shall be coated with straight, refined, pale, paraffin mineral oil, or other approved coating, and the coating for steel forms shall consist of refined mineral oil suitably compounded for the purpose.

6.5 Forms for Slopes or Battered Surfaces

Forms for sloped or battered surfaces shall be built so that the sheathing can be placed board-by-board immediately ahead of concrete placement so as to enable ready access for placement, vibration, and inspection of the concrete. The sheathing shall be built so that the sheathing can be removed board-by-board from the bottom to top.

6.6 Forms for Open Channel Transitions

When the warped surfaces of transitions are not back formed, natural or compacted earth shall be shaped to the specified surface and covered immediately with a plaster coat of cement-sand mortar at least 0.95 cm.

Forms for the warped surfaces shall be tied securely to the floor slab and braced against spreading. In the upper surface, forms shall be butt and removed as to enable ready access for placement, vibration, inspection, and repair and finishing of the concrete.

7.7 Removal of Forms

Forms shall be removed as soon as possible to enable the earliest practicable repair of surface imperfections. Any needed repair of treatment shall be performed at once, and be followed immediately by the specified curing. Forms shall be removed with care so as to avoid injuring of the concrete and any concrete so damaged shall be repaired.

7. 3000 psi Reinforced Concrete

7.1 General

This section covers all the materials as cement, aggregates, water, admixtures and proportioning, mixing, transporting, placing, finishing, curing and protecting of concrete, including supplies, equipment, tools and all other incidentals necessary for concrete works.

All the applicable provisions of the latest revision of the ACI Building Code (ACI - 318 -85) and American Society for Testing Materials (ASTM) shall govern in all cases not specifically provided for herein.

7.2 Concrete Composition

Concrete shall be composed of Portland Cement, fine and coarse aggregates, water and if necessary, admixtures or agents approved by DA-RAED. The design of the concrete mixtures and consistency shall be as specified in this Section.

7.3 Cement

7.3a General

All cement requirements of concrete works for the contract shall be contractor-furnished. The cement shall conform to the requirements of the standard specifications for Portland Cement (ASTM: C150 Type 1).

7.3b Storage

Contractor shall immediately upon delivery of cement to the jobsite store the same in a dry, watertight and properly ventilated structure with adequate provisions for the prevention of absorption of moisture. In order that cement may not become unduly aged after delivery, Contractor shall use cement stored at the project site for not over four months. It shall not be used unless retest proves it to be satisfactory.

Sacked cement shall not be stocked higher than 14 sacks for storage for a period of no longer than 30 days and not higher than seven (7) sacks for longer period.

7.4 Water

The water used in concrete, mortar and grout shall be free from objectionable quantities of silt, organic matter, alkali, salts and other impurities.

7.5 Fine Aggregates

7.5a General

The term “Fine Aggregates” is used to designate aggregates in which the maximum size of particles is 3/16 of an inch (6 millimeters). As a means of providing moisture control, the Contractor may be required to stockpile the fine aggregates over porous drain to get rid of excess water and to stabilize the moisture content.

7.5b Quality

Fine aggregates shall conform to the requirements of ASTM C-33 and shall consist of hard, tough, durable uncoated rock particles. The Contractor shall exercise every possible precaution in transporting, washing and screening operations to prevent contamination of sand particles.

7.5c Storage

Fine aggregates shall be stored in such a manner as to avoid the inclusion of any foreign materials in the concrete. All fine aggregates shall remain in free drainage storage for at least seventy-two (72) hours prior to use. Sufficient live storage shall be maintained at all times to permit continuous placement of concrete.

7.6 Coarse Aggregates

7.6a General

The term “Coarse Aggregate” is used to designate aggregates of such sizes as to fall within the range of 3/16 inch to 3 inches (0.5 cm to 7.5 cm.) or any size or range of sizes within such limits. Coarse aggregate for concrete shall be furnished by the Contractor and shall consist of crushed rock or mixture of natural gravel and crushed rock. Coarse aggregate as delivered to the batching plant shall have a uniform and stable moisture content. Any rewashing found necessary to provide clean aggregates shall be done prior to finish screening. Rewashing shall not be performed in finish screens.

7.6b Quality

Coarse aggregates shall conform to the requirements of ASTM C-33 and shall consist of hard, dense, uncoated durable rock fragments.

Unless otherwise directed, the maximum sizes of the aggregates to be used in concrete for the various parts of the work shall be in accordance with the following:

General Use	Maximum Aggregate Diameter
Lean concrete to control water intrusion and other miscellaneous uses	1-1/2 “ (37.5 mm)
Concrete for footings, walls, slabs, beams, 0.22 to 0.75 meters thick	1-1/2 “ (37.5 mm)
Concrete for thin walls, slabs, beams, less than 0.22 meters thick	3/4” (19 mm)
Concrete for reinforced concrete pipe	1/2" (12.5 mm)

7.6c Storage

Coarse aggregate storage or stockpiles shall be built in such a manner as to avoid the inclusion of any foreign materials in the concrete and to prevent segregation and excessive breakage. Water sprayers shall be installed to keep that portion of the coarse aggregate stockpiles saturated which is intended for immediate use in the concrete. Sufficient live storage shall be maintained at all times to permit continuous placement of concrete.

7.7 Classification & Proportioning of Concrete Mixtures

The mixtures for all classes of concrete shall be designed by the Contractor and approved by DA-RAED to obtain the compressive strength at the age of twenty-eight (28) days as specified below:

Class	Size of Maximum Dis. of Aggregate	Minimum Compressive Strength	Designated Size of Aggregate
A	1-1/2" (37.5 mm)	3,000 psi	37.5 mm to 4.75 mm
B	2" (50 mm)	2,400 psi	50 mm to 4.75 mm

7.8 Mixing Concrete

7.8a General

Concrete shall be machined mixed. Hand mixing shall be allowed only in cases of emergency when there is machine breakdown or malfunction and in the construction of small structures where the total volume of concrete is less than 2 cubic meters.

7.8b Mixing Time

Concrete shall be thoroughly mixed in a batch mixer of an approved capacity and type which will ensure a uniform and homogenous mixing of the concrete materials.

The minimum mixing time for each batch, after all materials and water are introduced into the mixer shall be as follows:

Capacity of Mixer	Mixing Time
0.60 cu. m. or smaller	1-1/2" minutes
0.60 to 1.20 cu. m.	1-1/2" minutes
1.50 to 2.30 cu. m.	2 minutes
3 cu. m.	2-1/2" minutes

Overmixing, requiring the introduction of additional water to preserve the required consistency, will not be permitted. Overmixed concrete shall be wasted.

Concrete, mortar and grout mixers which have developed initial set shall not be used. Concrete, mortar and grout which have partially hardened shall not be re-tempered or remixed.

7.8c Sampling and Testing of Concrete

The Contractor shall provide the required samples of concrete to DA-RAED without cost. Sampling will, in all cases, be under the direct supervision of the Project Engineer and Contractor shall provide without cost to DA-RAED all available tools and labor as may be required. Concrete sampling shall be carried on during concrete operations at the rate of one standard sample for each 75 cubic meters of concrete or fraction thereof placed during each continuous placing operation but in no case shall there be less than one sample for each day concreting. Each standard sample shall consist of three (3) standard cylinders 6-inch high. The Contractor shall keep a record of the samples and the portion of the structures and volume represented which shall be available to DA-RAED on demand.

Sampling shall conform to ASTM Designations C-172, preparation, storage and curing to ASTM Designation C-31 and testing to ASTM Designation C-39. The sample shall be tested by an approved testing laboratory at the expense of the Contractor.

7.9 Delivery and Placing Concrete

7.9a General

Concrete shall be placed at its final position in the forms within forty-five minutes after the introduction of the mixing water to the cement and aggregates, or the cement to the aggregates.

The rate of the delivery of concrete during concreting operation shall be such as to provide for the proper handling and placing of the concrete. The rate shall be such that the interval between batches shall not exceed 20 minutes. The method of delivering and handling the concrete shall be as such as to facilitate proper placing with the minimum of handling and without damage to the concrete structure.

Before concrete is placed, all saw dust, chips and other construction debris and extraneous matters shall be removed from the interior of forms. Struts, stays and bracers serving temporarily to hold the forms in correct shape and alignment, pending the placing of concrete at their location, shall be removed when the concrete placing has reached an elevation rendering their services unnecessary as the case may be. These temporary members shall be entirely removed from the forms and not to be buried in concrete. Surfaces of existing concrete left after partial demolition against which new concrete is to be placed, shall be cleared thoroughly of all loose concrete coating or concrete dust by brushing or other effective means followed by thorough washing or jetting. Such surfaces shall be kept moist for at least 24 hours before pouring the new concrete.

Concrete shall be conveyed from mixers to forms, as rapidly as practicable, by methods which will prevent segregation, or loss of ingredients.

7.9b Concrete on Earth Foundation

All concrete shall be placed on clean and damp surfaces free from standing or running water. Prior to placing concrete, the earth foundation shall be satisfactorily compacted as required.

7.9c Concrete on Rock or Other Concrete

Rock surface or hardened concrete upon or against which concrete is to be placed shall be clean, free from oil, water, mud, objectionable coatings, debris, loose and semi-detached or unsound fragments. Fault, fissures and seams in rock shall be cleaned to a satisfactory depth and to firm rock on the sides. Immediately before concrete is placed, all surfaces shall be cleaned thoroughly by the use of high velocity air water jets, wet sand blasting or other satisfactory means. When required by the Project Engineer, roughening by grooving with pneumatic tool of existing concrete surfaces against which concrete is to be placed is required. All surfaces shall be wetted before placing concrete and approximately horizontal surface shall be covered immediately, before the concrete is placed, with a layer of mortar not to exceed fifteen (15) millimeters in thickness and of the same cement-sand ratio as used in the concrete.

7.9d Lift in Concrete

The permissible depth of concrete placed in one lift will be as shown in the detailed Drawings or as directed for each structure by the Project Engineer. Unless otherwise authorized or shown, lifts of mass concrete shall not exceed 1.5 meters in height, and a minimum of seventy-two (72) hours shall elapse between the placing of each successive lifts. Lifts of three (3) meters will be permitted in piers and walls. Height of lift specified herein will not apply where the use of slip form has been approved. All concrete when placed and vibrated shall be approximately horizontal layers not to exceed fifty (50) centimeters in thickness unless otherwise specifically authorized. The placement of concrete shall be done at such a rate that all underlying layers concrete surfaces shall not have reached their initial set before additional concrete is placed thereon. Slabs shall generally be placed in one lift unless the depth is so great that this procedure will produce objectionable result.

7.9e Consolidation of Concrete

Consolidation of concrete shall be by the use of mechanical vibratory equipment. The vibrating equipment shall be of the interval type and shall at all times be adequate in number of units and the power of each unit shall be capable to consolidate all concrete. The frequency of vibration shall not be less than 6,000 revolutions per minute. Forms or surface vibrations shall not be used, unless otherwise specified in other Sections of this Technical Specifications. The duration of vibration shall be limited to that necessary to produce satisfactory consolidation without causing objectionable segregation. In consolidating each layer of concrete, the vibrator shall be operated in a near vertical position and the vibrating head shall be allowed to penetrate under the action of its own weight and vibrate the concrete in the upper portion of the underlying layer.

7.9f Finishing of Concrete Lift Surfaces

The manipulation of the concrete adjacent to the surface of the lift placement shall be the minimum necessary to produce not only the degree of consolidation desired in the surface layer of concrete but also a surface with the desired degree of roughness for the bond with the next lift. Surface vibration or excessive surface working

will not be permitted. All unfinished top surface not covered by forms and which are not to be covered by additional concrete or backfill shall be carried slightly above grade, as directed, and struck of by board finish.

7.9g Placing Concrete through Reinforcement

In placing concrete through reinforcement, care shall be taken that no segregation of the coarse aggregates occurs. On the bottom of the beams and slabs, where the congestion of steel near the forms makes a placing difficult, put the required concrete spacer before pouring the concrete.

8. Reinforcing Steel Bars

8.1 Scope of Work

All reinforcing steel bars required for the works as detailed in the Construction Drawings or as directed by the Engineer shall be furnished by the Contractor. The work under this section includes the hauling of all reinforcing steel bars required for construction works from source of procurement to the Project Site for storing, cutting, bending and proper placing of all required steel bars should be in accordance with the National Structural Code/ACI/ASTM standards with respect to the details and the specifications indicated in the detailed plan and POW.

All reinforcing steel bars will be furnished in commercial standard lengths and the Contractor shall cut and bend the reinforcing steel bars in accordance with the above-mentioned sound design procedures and standards/codes.

8.2 Materials

All reinforcing steel bars to be furnished by the Contractor shall be Grade 40 or PS 275, deformed type, and in accordance with the Philippine National Standards for Steel Bars for Concrete Reinforcement under PNS-49:2002, and also conforming to the requirements of ASTM Designation A-615 specifications.

The nominal dimension and unit weights of bar designation shall be in accordance with the following table:

Bar Designation Number	Unit Wt. (kg/m)	Diameter (mm)	Nominal Dimensions Cross-Section Area (mm ²)	Perimeter (mm)
10 mm	0.616	10	78.54	31.42
12 mm	0.888	12	113.1	37.7
16 mm	1.579	16	201.1	50.27

8.3 Workmanship

Workmanship shall be at the highest grade and quality, and shall be in accordance with the latest standard/ proper construction procedure. Workmanship shall conform to the following conditions:

8.3a Cutting and Bending

Cutting and bending of reinforcing bars may be done in shop or at the jobsite. Radii for bends and hooks will be specified on the approved detailed reinforcement in accordance with the prescription of the National Building Code/NSCP/ACI/ASTM.

8.3b Placing

Reinforcement shall be laid, anchored and embedded in the concrete as shown on the details or as directed by the Project Engineer. Unless otherwise directed, the spacing of reinforcement bars shall be measured on clear distance space between bars. Reinforcement shall be inspected for compliance with requirements as to size, length, splicing, position and number after installation based on the above said standards/codes.

Before reinforcement are placed, the surfaces of the bars and the surfaces of any metal bar support shall be cleaned of heavy flaky rust, loose scales, dirt, grease or other foreign substance or which in the opinion of the Project Engineer are objectionable. After being placed, the reinforcing bars shall be maintained in a clean condition until completely embedded in concrete.

Reinforcing bars shall be accurately placed and secured in position so as to avoid displacement during pouring of concrete. Special care shall be exerted to prevent any disturbance of the embedded reinforcement during the setting of the concrete. Metal chairs, hangers, spacers or other approved support may be used by the Contractor for supporting reinforcing bars. Metal supports shall be galvanized when they are to be exposed to view on completed concrete surfaces or where its use will contribute in any way to the discoloration or deterioration of the concrete.

8.3c Relation of Bars to Concrete Surfaces

The minimum cover for all reinforcements shall conform to the dimensions shown on the detailed reinforcement in accordance with ACI-518 specifications, or as maybe directed by the Project Engineer assigned.

8.3d Splicing

All splices in reinforcement shall be directed by the Project Engineer or whose length varies depending upon the limitations as prescribed by the National Structural Code. The lapped ends to bars shall be either supported sufficiently to permit the embedment of the entire surface of each bar in concrete or shall be securely wired, observing proper spacing indicated in ACI/NSCP.

8.3e Protection

Reinforcement to remain exposed and intended for future concrete embedment shall be protected from corrosion or other damages in an approved manner where directed. The reinforcement protection shall be of such nature that it can be thoroughly cleaned without difficulty prior to encasement in concrete.

8.4 Sampling for Testing and Acceptance of Materials

Sampling for testing and acceptance of all reinforcement steel bars furnished shall be the responsibility of the Contractor.

9. Stone/ Rubble Masonry

The work under this Section shall include construction of all necessary form work, placing rubble stone and concrete binder on an approved foundation and form work; the removal of forms and curing of the rubble masonry, all in accordance with the ACI specifications or as directed by the DA Project Engineer.

Rubble stones shall consist of field stones. They are clean, sound, durable, resistant to the action of water, and must have specific gravity of at least two and six tenths (2.6), in diameters ranging from 15 cm. to 30 cm., sixty percent (60%) of which comprises the bigger sizes. Concrete binder shall be class A concrete with 1 ½ (37.5 mm) maximum size of aggregate.

The stone shall be thoroughly wet before they are installed in place. The entire surface of every stone shall be thoroughly covered with concrete binder as needed. The stones shall be well set such that no stone will project beyond the lines indicated on the drawings. The concrete binder shall be properly placed into the spaces between stones so that no void is left within the rubble masonry. Concrete layer of 10 cm. or as specified on the plan details shall be placed as outer layer of cover of the rubble masonry as finishing to coincide with neat lines of the structure. In case reinforcements are placed, no stone shall be closer than 3 inches (7.5 cm) to the nearest reinforcing bars. Rubble masonry shall be cured by water for five (5) days.

10. Steelgate

A vertical steel gate shall be installed in accordance with the details and specifications on the Drawings.

Prior to pouring of concrete, all anchor bolts and bars and other metalworks for the gate which are to be embedded in concrete shall be set and supported rigidly and accurately in position. Such will be maintained during pouring of concrete. The surface of concrete upon which grout will be applied shall be thoroughly cleaned of all laitance, loose concrete coatings or foreign materials by brushing, sand-blasting or other effective cleaning method, and then followed by thorough washing.

For the steel gate, anchor bars fitted and welded into the gate frame shall be set and positioned as accurately as shown on the Drawings. The gate frame and guide shall be held plumb and erect before concrete is placed and during placement of grout.

The gates shall be handled carefully so that no parts will be bent, broken or otherwise damaged. Hammering that will injure or distort the members will not be permitted. Damage due to improper assembly or other damage due to other causes shall be immediately replaced or repaired to the satisfaction of DA-RAED. The members shall not be overstressed during the erection.

The lifting mechanism shall be installed complete with lifting nut, shafting, sheet bearings, anchor bolts and all other materials for complete assembly. Lifting mechanism shall be assembled and accurately placed in correct alignment by the use of shims and wedges between the sole plates and base plates and concrete. Dry packing shall be done after the dry pack has set.

For best installation results, the gates should be assembled and in proper position before concrete is placed. The gate slide must be in position in the wedge block to prevent springing and leakage in gate seat.

If the concrete is placed before the gate is in position, a recess shall be provided at the proper place for subsequent grouting-in of the gate seat. Anchor bolts and bars shall be properly secured in their final positions when the concrete is placed. No anchor bolts and bar are embedded in concrete shall be disturbed, at least seven days after they have been installed. The surface of concrete against which grout is to be placed shall be cleaned thoroughly of all laitance, loose concrete coatings, or foreign materials by brushing, sand-blasting or other effective means followed by thorough washing and shall be kept moist for at least 24 hours before placing grout. The seat shall be carefully grouted. The gate shall never be tightened to an uneven concrete surface, as it will spring and cause leakage.

After the gate is installed, the Contractor shall make sure that all concrete is removed from the slots and seating surfaces, and the slide plate and stem are free to travel to full-open position. A removable handwheel lift and hand wheel pedestal lifts shall be installed in accordance with the Drawings.

Handwheel pedestal lifts shall be mounted on concrete. The pedestal lift shall be assembled and accurately placed in perfect alignment by the use of grout shims under the pedestal.

Bolts, screws and all fittings shall be tightened firmly and uniformly. The alignment of all parts with respect to each other shall be true, and gate parts shall be set to the elevation shown on the Drawings.

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1 Clearing, Layout and Staking *(Refer to Item B.1)*

2 Excavation (Manual) *(Refer to Item B.4)*

3 Reinforcing Steel Bars *(Refer to Item B.8)*

4 Formworks *(Refer to Item B.6)*

5 2400 psi Reinforced Concrete *(Refer to Item B.7)*

6 Backfill

The work shall consist of hauling and backfilling with suitable materials taken from Structure Excavation, all spaces excavated and not occupied by the structure, all spaces between the natural ground surface and the finish lines indicated and all other sections to be filled or as directed by the Project Engineer, compacting to the desired degree of compaction the said materials after placement, all in accordance with the plans, drawings and specifications in the conformity with the lines, grades and dimensions shown in the drawings or as ordered by the Project Engineer. It shall also include removal of all unsuitable materials or as ordered by the Project Engineer.