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VIETNAM

ENVIRONMENTAL REMEDIATION AT DA NANG AIRPORT

Technical Specifications

Dig and Haul Component

Issued for Bid

April 2011

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TABLE OF CONTENTS

DIVISION 1 - GENERAL REQUIREMENTS

01005	General Requirements
01010	Summary of Work
01014	Construction Sequence
01025	Measurement and Payment
01041	Project Coordination
01050	Field Engineering
01095	References Standards
01100	Special Project Procedures
01110	Environmental Protection Procedures
01152	Applications for Payment
01153	Change Order Procedures
01200	Project Meetings
01300	Submittals
01310	Construction Schedules
01370	Schedule of Values
01390	Construction Photographs
01410	Testing and Testing Laboratory Services
01500	Temporary Facilities and Utilities
01610	Material and Equipment
01630	Substitutions and Product Options
01700	Contract Closeout
01710	Cleaning
01720	Project Record Documents
01740	Warranties and Bonds

DIVISION 2 - SITEWORK

02050	Demolition
02100	Site Preparation
02140	Dewatering and Drainage
02200	Earthwork
02270	Sedimentation and Erosion Control
02273	Geotextile Fabric
02370	Rip Rap
02505	Crushed Stone Paving
02605	Precast Concrete Manholes
02612	Reinforced Concrete Drain Pipe
02610	Concrete Masonry Unit Containment Wall
02776	HDPE Liner
02821	Security Fencing
02901	Miscellaneous Work and Cleanup
02985	Seeding and Mulching

TABLE OF CONTENTS

DIVISION 3 – CONCRETE

03100	Concrete Formwork
03200	Concrete Reinforcement
03300	Cast-In-Place Concrete
03521	Lightweight Insulating Concrete

DIVISION 4 – MASONRY – NOT USED

DIVISION 5 - METALS – NOT USED

DIVISION 6 – WOOD AND PLASTICS – NOT USED

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

07210	IPTD Thermal Insulation
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DIVISION 8 – DOORS AND WINDOWS – NOT USED

DIVISION 9 – FINISHES – NOT USED

DIVISION 10 – SPECIALTIES – NOT USED

DIVISION 11 – EQUIPMENT – NOT USED

DIVISION 12 – FURNISHINGS – NOT USED

DIVISION 13 – SPECIAL CONSTRUCTION – NOT USED

DIVISION 14 – CONVEYING SYSTEM – NOT USED

DIVISION 15 – MECHANICAL – NOT USED

DIVISION 16 – ELECTRICAL – NOT USED

SECTION 01005

GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE AND INTENT

A. Description

1. The work to be completed consists of the furnishing of all labor, materials and equipment, and the performance of all work included in this Contract. The summary of the work is presented in Section 01010.
2. The Contract work will be managed and overseen by three principal authorities: The USAID CONTRACTING OFFICER (CO), THE USAID CONTRACTING OFFICER'S TECHNICAL REPRESENTATIVE (COTR), and the USAID CONSTRUCTION MANAGEMENT CONTRACTOR (CMC). Each of these entities has specific delegated authorities and limitations thereof. In summary, the CO is the only entity authorized to approve all agreements, commitments, or modifications which involve prices, quantities, quality, and schedules. The CO delegates to the COTR the authority to provide technical direction, including the approval of work plans, and to monitor progress and inspect deliverables for acceptance. The COTR responsibilities and limitations are further defined in Section G.4 of the RFP. The COTR represents the CO and works closely with the CO to review actions under the CO's authority. The CMC will maintain an on-site presence for daily review of the work being undertaken for compliance with the specifications and schedules set forth in this contract. The CMC responsibilities and limitations are further defined in Section C.3 of the RFP. The CMC will work closely with the COTR and CO to provide guidance for actions that are under their respective authorities.

B. Work Included

1. The CONTRACTOR shall furnish all labor, superintendence, quality control, materials, power, light, fuel, water, tools, appliances, equipment, supplies, and other means of construction necessary and proper for performing and completing the work. CONTRACTOR shall perform and complete the work in the manner best calculated to promote scheduled construction consistent with safety of life and property and to the satisfaction of the USAID COTR OR DESIGNATE, and in strict accordance with the Contract Documents. The CONTRACTOR shall clean up the work and maintain it during and after construction, until accepted, and shall do all work and pay all costs incidental thereto. CONTRACTOR shall repair or restore all structures and property that may be damaged or disturbed during performance of the work.
2. The cost of incidental work described in these General Requirements, for which there are no specific Contract Items, shall be considered as part of the general cost

of doing the work and shall be included in the prices for the various Contract Items. No additional payment will be made therefore.

3. The CONTRACTOR shall provide and maintain such modern tools, and equipment as may be necessary, in the opinion of the USAID COTR OR DESIGNATE, to perform in a satisfactory and acceptable manner all the work required by this Contract. Only equipment of established reputation and proven efficiency shall be used. The CONTRACTOR shall be solely responsible for the adequacy of workmanship, materials and equipment, prior approval of the USAID COTR OR DESIGNATE notwithstanding.

1.02 PLANS AND SPECIFICATIONS

A. Plans

1. When obtaining data and information from the Plans, figures shall be used in preference to scaled dimensions and large scale drawings in preference to small scale drawings.

B. Copies Furnished to CONTRACTOR

1. The CONTRACTOR shall furnish each of the subcontractors, manufacturers, and material men such copies of the Contract Documents as may be required for their work. Additional copies of the Plans and Specifications, when requested may be furnished to the CONTRACTOR at cost of reproduction.

C. Supplementary Drawings

1. When, in the opinion of the USAID COTR OR DESIGNATE, it becomes necessary to explain more fully the work to be done or to illustrate the work further or to show any changes which may be required, drawings known as Supplementary Drawings, with specifications pertaining thereto, will be prepared by the USAID COTR OR DESIGNATE and three paper prints thereof will be given to the CONTRACTOR.

D. CONTRACTOR To Check Plans and Data

1. The CONTRACTOR shall verify all dimensions, quantities and details shown on the Plans, Supplementary Drawings, Schedules, Specifications or other data received from the USAID COTR OR DESIGNATE, and shall notify the USAID COTR OR DESIGNATE of all errors, omissions, conflicts and discrepancies found therein. Failure to discover or correct errors, conflicts or discrepancies shall not relieve the CONTRACTOR of full responsibility for unsatisfactory work, faulty construction or improper operation resulting there from nor from rectifying such conditions at his own expense. CONTRACTOR will not be allowed to take advantage of any errors or omissions, as instructions will be furnished by the USAID COTR OR DESIGNATE, should such errors or omissions be discovered. All schedules are given for the convenience of the USAID COTR OR DESIGNATE and the CONTRACTOR and are not guaranteed to be complete.

The CONTRACTOR shall assume all responsibility for the making of estimates of the size, kind, and quality of materials included in work to be done under the Contract.

1.03 MATERIALS AND EQUIPMENT

A. Manufacturer

1. The names of proposed manufacturers, suppliers and dealers who are to furnish materials or other appurtenances shall be submitted to the USAID COTR OR DESIGNATE for approval. Such approval must be obtained before shop drawings will be checked. No manufacturer will be approved for any materials to be furnished under this Contract unless they are of good reputation and have a plant of ample capacity. The MANUFACTURER shall, upon the request of the USAID COTR OR DESIGNATE, be required to submit evidence that they have manufactured a similar product to the one specified and that it has been previously used for a like purpose for a sufficient length of time to demonstrate its satisfactory performance.
2. All transactions with the manufacturers or subcontractors shall be through the CONTRACTOR, unless the CONTRACTOR shall request, in writing to the USAID COTR OR DESIGNATE, that the manufacturer or subcontractor deal directly with USAID. Any such transactions shall not in any way release the CONTRACTOR from their full responsibility under this Contract.
3. Any two or more pieces of material of the same kind, type or classification, and being used for identical types of service, shall be made by the same manufacturer.

B. Delivery

1. The CONTRACTOR shall deliver materials in ample quantities to ensure the most speedy and uninterrupted progress of the work so as to complete the work within the allotted time. The CONTRACTOR shall also coordinate deliveries in order to avoid delay in, or impediment of, the progress of the work of any other CONTRACTOR or related work.

C. Service of MANUFACTURER's Engineer

1. The Contract prices for material shall include the cost of furnishing (as required by specifications sections) a competent and experienced engineer or superintendent who shall represent the manufacturer and shall assist the CONTRACTOR, when required, to install, adjust, test and place into service the work in conformity with the Contract Documents.

1.04 INSPECTION AND TESTING

A. General

1. Inspection will be performed by the USAID COTR OR DESIGNATE and all testing of materials will be performed by the CONTRACTOR unless otherwise specified.
2. For tests specified to be made by the CONTRACTOR, the testing personnel shall make the necessary inspections and tests and the reports thereof shall be in such form as will facilitate checking to determine compliance with the Contract Documents. Six (6) copies of the reports shall be submitted and authoritative certification thereof must be furnished to the USAID COTR OR DESIGNATE as a prerequisite for the acceptance of any material or equipment.
3. If, in the making of any test of any material, it is ascertained by the USAID COTR OR DESIGNATE that the material does not comply with the Contract, the CONTRACTOR will be notified thereof and will be directed to refrain from delivering said material, or to remove it promptly from the site or from the work and replace it with acceptable material, without cost to USAID.
4. The CONTRACTOR shall be fully responsible for the proper operation of material during tests and construction periods and shall neither have nor make any claim for damage which may occur to material prior to the time when the USAID COTR OR DESIGNATE formally takes over the operation thereof.

B. Costs

1. Inspection and testing of materials furnished under this Contract will be performed by the CONTRACTOR and tested by an independent Quality Control laboratory which will be retained by the CONTRACTOR and approved by the USAID COTR OR DESIGNATE, unless otherwise expressly specified as referenced in Section 01410 or other Contract Document Sections.
2. The cost of manufacture and field tests of material and of certain other tests specifically called for in the Contract Documents shall be borne by the CONTRACTOR and such costs shall be deemed to be included in the Contract price.
3. Materials submitted by the CONTRACTOR as the equivalent to those specifically named in the Contract may be tested by the USAID COTR OR DESIGNATE for compliance. The CONTRACTOR shall reimburse USAID for the expenditures incurred in making such tests on materials which are rejected for non-compliance.

C. Inspection of Materials

1. The CONTRACTOR shall give notice in writing to the USAID COTR OR DESIGNATE, sufficiently in advance of the intention to commence the manufacture or preparation of materials especially manufactured or prepared for

use in or as part of the permanent construction. Such notice shall contain a request for inspection, the date of commencement and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, the USAID COTR OR DESIGNATE will arrange to have a representative present at such times during the manufacture as may be necessary to inspect the materials or the USAID COTR OR DESIGNATE will notify the CONTRACTOR that the inspection will be made at a point other than the point of manufacture, or the USAID COTR OR DESIGNATE will notify the CONTRACTOR that inspection will be waived. The CONTRACTOR must comply with these provisions before shipping any material. Such inspection shall not release the CONTRACTOR from the responsibility for furnishing materials meeting the requirements of the Contract Documents.

D. Certificate of Manufacture

1. When inspection is waived or when the USAID COTR OR DESIGNATE so requires, the CONTRACTOR shall furnish authoritative evidence in the form of Certificates of Manufacture that the materials to be used in the work have been manufactured and tested in conformity with the Contract Documents. These certificates shall be notarized and shall include copies of the results of physical tests and chemical analyses, where necessary, that have been made directly on the product or on similar products of the MANUFACTURER.

E. Preliminary Field Tests

1. As soon as conditions permit, the CONTRACTOR shall furnish all labor, materials, and instruments and shall make preliminary field tests of material. If the preliminary field tests disclose any material furnished under this Contract which does not comply with the requirements of the Contract Documents, the CONTRACTOR shall, prior to the acceptance tests, make all changes, adjustments and replacements required. The furnishing CONTRACTOR shall assist in the preliminary field tests as applicable.

F. Final Field Tests

1. Upon completion of the work and prior to Substantial Completion, all site work and materials installed under this Contract shall be subjected to acceptance tests as specified or required to prove compliance with the Contract Documents. The CONTRACTOR shall furnish labor, fuel, energy, water and all other materials, equipment and instruments necessary for all acceptance tests, at no additional cost to USAID. The Supplier shall assist in the final field tests as applicable.

G. Failure of Tests

1. Any defects in the materials or their failure to meet the tests, guarantees or requirements of the Contract Documents shall be promptly corrected by the CONTRACTOR by replacements or otherwise. The decision of the USAID COTR OR DESIGNATE as to whether or not the CONTRACTOR has fulfilled their

obligations under the Contract shall be final and conclusive. If the CONTRACTOR fails to make these corrections or if the improved materials, when tested, shall again fail to meet the guarantees or specified requirements, the USAID COTR OR DESIGNATE, notwithstanding its partial payment for work, and materials, may reject the materials and may order the CONTRACTOR to remove them from the site at their own expense. In addition, the CONTRACTOR will be responsible for payment of laboratory testing costs for work not in compliance with the Contract Documents.

2. In case the USAID COTR OR DESIGNATE rejects any materials, then the CONTRACTOR shall replace the rejected materials within a reasonable time. If CONTRACTOR fails to do so, USAID may, after the expiration of a period of thirty (30) calendar days after giving notice in writing, proceed to replace such rejected materials, and the cost thereof shall be deducted from any compensation due or which may become due the CONTRACTOR under this Contract.

H. Final Inspection

1. In no case will the final estimate be prepared until the CONTRACTOR has complied with all requirements set forth and the USAID COTR OR DESIGNATE has made final inspection of the entire work and is satisfied that the entire work is properly and satisfactorily constructed in accordance with the requirements of the Contract Documents.

1.05 LINES AND GRADES

A. Grade

1. All work under this Contract shall be constructed in accordance with the lines and grades shown on the Plans, or as given by the USAID COTR OR DESIGNATE. The full responsibility for keeping alignment and grade shall rest upon the CONTRACTOR.

B. Safeguarding Marks

1. The CONTRACTOR shall safeguard all points, stakes, grade marks, monuments and bench marks made or established on the work, bear the cost of reestablishing them if disturbed, and bear the entire expense of rectifying work improperly installed due to not maintaining or protecting or to removing without authorization such established points, stakes and marks.
2. The CONTRACTOR shall safeguard all existing and known property corners, monuments and marks adjacent to but not related to the work especially monuments associated with the special exception area boundary, and, if required, shall bear the cost of reestablishing them if disturbed or destroyed.

1.06 ADJACENT STRUCTURES AND LANDSCAPING

A. Responsibility

1. The CONTRACTOR shall also be entirely responsible and liable for all damage or injury as a result of CONTRACTOR operations to all other adjacent public and private property, structures of any kind and appurtenances thereto met with during the progress of the work. The cost of protection, replacement in their original locations and conditions or payment of damages for injuries to such adjacent public and private property and structures affected by the work, whether or not shown on the Plans, and the removal, relocation and reconstruction of such items called for on the Plans or specified shall be included in the various Contract Items and no separate payments will be made therefore. Where such public and private property, structures of any kind and appurtenances thereto are not shown on the Plans and when, in the opinion to avoid interference with the work, payment therefore will be made as provided for in the General Conditions.
2. CONTRACTOR is expressly advised that the protection of wetlands, structures, etc. and related work adjacent and in the vicinity of CONTRACTOR operations, wherever they may be, is solely the CONTRACTOR responsibility. Conditional inspection of wetlands or structures in the immediate vicinity of the project which may reasonably be expected to be affected by the Work shall be performed by and be the responsibility of the CONTRACTOR.
3. CONTRACTOR shall, before starting operations, make an examination of the existing structures to remain and record by notes, measurements, photographs, etc., conditions which might be aggravated by open excavation and construction. Repairs or replacement of all conditions disturbed by the construction shall be made to the satisfaction of the USAID COTR OR DESIGNATE. This does not preclude conforming to the requirements of the insurance underwriters. Copies of surveys, photographs, reports, etc., shall be given to the USAID COTR OR DESIGNATE.
4. Prior to the beginning of any excavations, the CONTRACTOR shall advise the USAID COTR OR DESIGNATE of all buildings or structures on which the CONTRACTOR intends to perform work or which performance of the project work will affect. The CONTRACTOR shall be responsible for performing work in compliance with applicable permits.

1.07 PROTECTION OF WORK AND PUBLIC

A. Barriers and Lights

1. During the prosecution of the work, the CONTRACTOR shall put up and maintain at all times such barriers and lights as will effectually prevent accidents. The CONTRACTOR shall provide suitable barricades, red lights, "danger" or "caution" or "street closed" signs and watchmen at all places where the work causes obstructions to the normal traffic or constitutes in any way a hazard to the public.

B. Smoke Prevention

1. A strict compliance with ordinances regulating the production and emission of smoke will be required. No open fires or burning will be permitted.

C. Noise

1. The CONTRACTOR shall eliminate noise to as great an extent as practicable at all times. Air compressing plants shall be equipped with silencers and the exhaust of all gasoline motors or other power equipment shall be provided with mufflers. In the vicinity of hospitals and schools, special care shall be used to avoid noise or other nuisances. The CONTRACTOR shall strictly observe all local regulations covering noise control.

D. Dust Prevention

1. The CONTRACTOR shall prevent dust nuisance from their operations or from traffic at all times by keeping the roads and/or construction areas sprinkled with water.
2. Refer to the sections contained in the Site Health and Safety Plan for additional requirements on air and dust monitoring, and dust control.

1.8 CUTTING AND PATCHING

- A. The CONTRACTOR shall do all cutting, fitting or patching of his portion of the work that may be required to make the several parts thereof join and coordinate in a manner satisfactory as determined by the USAID COTR OR DESIGNATE and in accordance with the Plans and Specifications.
- B. The work must be done by competent workmen skilled in the trade required by the restoration.

1.9 CLEANING

A. During Construction

1. During construction of the work, the CONTRACTOR shall, at all times, keep the site of the work and adjacent premises as free from material, debris and rubbish as is practicable and shall remove the same from any portion of the site if, in the opinion of the USAID COTR OR DESIGNATE, such material, debris, or rubbish constitutes a nuisance or is objectionable.
2. The CONTRACTOR shall stockpile at approved areas on the site all surplus materials and temporary structures when no further need therefore develops. Fill of any type is not allowed to be removed from site without the explicit written permission of the USAID COTR OR DESIGNATE.

B. Final Cleaning

1. At the conclusion of the work, all tools, temporary structures and materials belonging to the CONTRACTOR shall be promptly taken away, and CONTRACTOR shall remove and promptly dispose of all water, dirt, rubbish or any other foreign substances.
2. The CONTRACTOR shall thoroughly clean all materials installed and shall deliver such materials undamaged in a clean and new condition.

1.10 MISCELLANEOUS

A. Protection Against Siltation and Bank Erosion

1. The CONTRACTOR shall arrange operations to minimize siltation and bank erosion on construction sites and on existing or proposed water courses and drainage ditches.
2. The CONTRACTOR, at their own expense, shall remove any siltation deposits and correct any erosion problems as determined by the USAID COTR OR DESIGNATE which results from the CONTRACTOR's construction operations.
3. The CONTRACTOR shall follow erosion control practices as defined in this Contract.

B. Existing Facilities

1. The work shall be so conducted to maintain existing facilities in operation. Requirements and schedules of operations for maintaining existing facilities in service during construction shall be as described in the Specific Provisions. No electrical outages will be allowed. Standby power must be provided.

C. Use of Chemicals

1. All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant, or of other classification, must show approval of either Vietnamese regulations, the Airport, USEPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with MANUFACTURER's instructions and local and federal regulations.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

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SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.01 LOCATION OF WORK

- A. The work of this Contract is located at the Da Nang Airport property generally located within Da Nang City, Vietnam. The work includes construction of the In-Pile Thermal Desorption (IPTD) treatment pile structure and the excavation, transport, and placement of dioxin-contaminated sediment/soil in the IPTD pile structure.

1.02 SCOPE OF WORK

- A. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals required to perform the Work as shown on the Drawings, remediation planning documents, and specified herein.
- B. The Work includes, but is not necessarily limited to, the following:
 - 1. Installing erosion and sediment control measures and establishing surface water runoff diversions around the main project work areas to minimize the amount of water coming in contact with the project area and to control sediment-laden runoff from leaving the construction areas.
 - 2. In designated contaminated areas, clearing the site by removing the vegetation down to the ground surface. The cleared surface vegetation shall be removed from the site and disposed of in accordance with local laws and regulations. The remaining stumps and roots shall be removed as part of the excavation, mulched, and mixed in with the contaminated soils and sediments placed in the IPTD pile structure. In non-contaminated areas, clearing and grubbing shall be performed to remove the vegetation, stumps, and roots and the material shall be removed from the site and disposed of in accordance with local laws and regulations.
 - 3. Installation and operation of equipment decontamination stations to prevent the spread of contamination from work areas.
 - 4. Removal and disposal, in accordance with applicable local laws and regulations, of all existing man-made items interfering with construction or indicated on the Drawings. These items may include, but are not limited to, the concrete protective coverings, roadway pavement, ditch and channel linings, fences, walls, culverts, miscellaneous structures, and other debris. Prior to removal from the site, demolition items located in the dioxin-contaminated areas shown in the Drawings shall be cleaned to remove potential contaminated soils and sediments.
 - 5. Construction of new site access road and IPTD pile laydown area, including fill placement, excavation, road surfacing, installation of culverts, and providing security fencing, as shown in the Drawings.

6. Construction of the IPTD pile structure including a concrete slab and insulation floor system, concrete block embankment, access ramp, and insulation and steel panels as shown on the Drawings and specified herein.
7. Excavation, moisture conditioning, and transport of the contaminated sediment/soil and placement in IPTD pile structure for Phase I treatment as shown in the Drawings.
8. Complete site restoration activities for Phase I including backfilling of identified excavated areas with clean fill material from an off-site borrow source, seeding the site, and placing erosion control measures to promote site stabilization.
9. Following completion of the Phase I treatment cycle by the IPTD contractor, quenching and removing the treated material from the pile structure and stockpiling at an on-site designated location.
10. Excavation, moisture conditioning, and transport of the contaminated sediment/soil and placement in IPTD pile structure for Phase II treatment as shown in the Drawings.
11. Complete site restoration activities for Phase II including backfilling of identified excavated areas with clean fill material from an off-site borrow source, seeding the site, and placing erosion control measures to promote site stabilization.
12. Following completion of the Phase II treatment cycle by the IPTD contractor, quenching and removing the treated material from the pile structure and stockpiling at an on-site designated location.
13. Deconstruct the IPTD pile structure following the completion of treatment by the IPTD contractor.
14. In addition to the Drawings and Specifications, comply with requirements presented in the following remediation planning documents:
 - a. Remediation Work Plan
 - b. Site Health and Safety Plan
 - c. Site-Wide Sampling and Analysis Plan

1.03 SPECIAL PROJECT PROVISIONS

- A. The CONTRACTOR shall adhere to the Remediation Work Plan, which provides guidance for the planned remediation and defines the roles and responsibilities of all project entities and personnel. The Remediation Work Plan will serve as a guidance document as remediation proceeds. The schedule and milestones presented in the Contract shall supersede those presented in the Remediation Work Plan.

- B. All Work performed shall be done in accordance with an appropriate Health and Safety Plan developed by the CONTRACTOR. This program shall insure adequate protection for his personnel and shall be in accordance with all applicable regulatory requirements and the Site Health and Safety Plan.
- C. The Site-Wide Sampling and Analysis Plan describes the sampling objectives, locations, measurement methods, and data quality objectives for the Project. The CONTRACTOR shall conduct the sampling identified as their responsibility, and shall accommodate and provide access to the USAID COTR OR DESIGNATE to conduct their sampling.

1.04 ROLES AND RESPONSIBILITIES

- A. Refer to the Remediation Work Plan for the roles and responsibilities of all parties involved in the implementation of the remediation project at Da Nang Airport.

1.05 SUBSTANTIAL COMPLETION

- A. The following items are required to be completed to achieve Substantial Completion:

1. Phase I

- a. Complete construction of site access road and IPTD laydown area.
- b. Complete construction of IPTD Pile Structure.
- c. Excavate, transport, and place Phase I soils/sediments in IPTD Pile Structure.
- d. Remove and stockpile Phase I treated soils/sediments.
- e. Complete site restoration activities for Phase I excavation areas.
- f. Submit certified site surveys for Phase I activities (refer to Section 01050).
- g. Submit Project Record Drawings for Phase I (refer to Section 01720).

2. Phase II

- a. Excavate, transport, and place Phase II soils/sediments in IPTD Pile Structure.
- b. Remove and stockpile Phase II treated soils/sediments.
- c. Complete deconstruction of the IPTD pile structure following Phase II treatment.
- d. Complete site restoration activities for Phase II excavation areas and IPTD Laydown and Pile areas.
- e. Submit certified site surveys for Phase II activities (refer to Section 01050).

f. Submit Project Record Drawings for Phase II (refer to Section 01720).

1.06 FINAL ACCEPTANCE

- A. The following items are required to be completed to achieve Final Acceptance:
1. Completion and USAID COTR OR DESIGNATE's approval of punch list items for each phase.
 2. USAID COTR OR DESIGNATE's recommendation of CONTRACTOR's proposal for a final change order, if applicable.
 3. USAID COTR OR DESIGNATE's recommendation of CONTRACTOR's request for final payment and USAID's acceptance of final invoice.

1.07 WORK SEQUENCE

- A. Perform work to ensure completion of the work in the contract time and in accordance with the sequencing presented on the Drawings. Completion dates of the various stages shall be in accordance with the approved construction schedule submitted by the CONTRACTOR.
- B. See Section 01014 for additional requirements.

1.08 CONSTRUCTION AREAS

- A. CONTRACTOR shall limit his use of the construction areas for work and for storage, to allow for:
1. Work by other contractors.
 2. Use by Airport operations.
- B. Coordinate use of work site with USAID COTR OR DESIGNATE, IPTD Contractor, and Airport operations.
- C. Assume full responsibility for the protection and safekeeping of Products under this Contract, stored on the site.
- D. Move any stored products, equipment, or any other items under CONTRACTOR's control which interfere with operations of the Airport or other contractor(s).
- E. Obtain and pay for the use of additional storage or work areas needed for operations.
- F. CONTRACTOR shall at all times conduct his operations as to ensure the least inconvenience to airport operations and the general public.

1.09 PLANS AND SPECIFICATIONS

A. Specifications

1. The Technical Specifications consist of three parts: General, Products, and Execution. The General Section contains General Requirements which govern the work. Products and Execution modify and supplement these requirements by providing additional detailed criteria of the work and shall always govern whenever there appears to be a conflict.

B. Intent

1. All work called for in the Specifications is applicable to this Contract, but not shown on the Plans in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified in either the Plans or in the Specifications, but involved in carrying out their intent or in the complete and proper execution of the work, is required and shall be performed by the CONTRACTOR as though it were specifically delineated or described.
2. The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, and interpretation of these Specifications shall be made upon that basis.
3. The inclusion of the General Requirements (or work specified elsewhere) in the General part of the Specifications is only for the convenience of the CONTRACTOR, and shall not be interpreted as a complete list of related Specification Sections.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01014

CONSTRUCTION SEQUENCE

PART 1 GENERAL

1.01 SITE CONDITIONS

- A. Several areas of construction under this contract will need to be coordinated with the IPTD contractor doing work on this project and must be coordinated with the ongoing Airport operations to allow construction to be completed within the time allowed by Contract Documents.
- B. CONTRACTOR is required to coordinate all activities in the interface or common areas with other contractors, the Airport, and/or the USAID COTR OR DESIGNATE.
- C. During testing and sampling, CONTRACTOR should make available the manpower and equipment required to make any necessary adjustments and provide access to the work areas as required by the USAID COTR OR DESIGNATE.

1.02 CONSTRUCTION CONSTRAINTS

- A. The following is a list of constraints which CONTRACTOR should consider in developing their overall plan of construction. This list is not intended to release CONTRACTOR from the responsibility to coordinate the work in any manner which will ensure project completion within the time allowed. The following areas are not necessarily listed in their required sequence of construction, nor is it intended to be a complete list of work items.

1. Coordination

- a. CONTRACTOR shall coordinate the work with other on-site contractors (refer to Section 01100).
- b. CONTRACTOR shall coordinate all work with USAID COTR OR DESIGNATE and the Airport to avoid disruption of airport operations.
- c. The CONTRACTOR shall commence construction and loading of the pile structure prior the start of the rainy season. Construction shall be completed as expeditiously as possible within the constraints of materials and quality control. In the event that the pile construction and loading are not completed before the start of the rainy season, the CONTRACTOR shall utilize a temporary waterproof, protective cover over the pile to protect the partially completed structure from rainwater infiltration.
- d. The CONTRACTOR shall coordinate the removal of treated sediment/soil from the IPTD pile with the USAID COTR OR DESIGNATE and IPTD contractor.

- e. The CONTRACTOR shall coordinate the backfilling of excavations with the USAID COTR OR DESIGNATE. Backfilling shall not begin until confirmation sampling as outlined in the Site-Wide Sampling Analysis Plan has indicated acceptance of the excavation.

2. Access

- a. New site access road shall be provided from the airport ring road as shown in the Drawings.
- b. The CONTRACTOR must coordinate work on the new site access road with the existing airport operations, construction activities associated with expansion of the taxiway and apron, and excavation activities.
- c. The new site access road is to remain in place following completion of the project.

1.03 CONSTRUCTION SEQUENCE

A. Phase I

1. Clear project areas of UXO (by others).
2. Install erosion and sediment control measures around Phase I excavation areas.
3. Remove vegetation down to the ground surface.
4. Perform demolition activities in the area to be excavated.
5. Excavate and moisture condition contaminated soils/sediments. Verify the removal of contaminated material through surveys and confirmation sampling. Confirmation sampling to be performed by USAID COTR OR DESIGNATE.
6. Following excavation of contaminated soils/sediments along the alignment of the access road and within the limits of the IPTD pile structure location, construct the access road and IPTD laydown area.
7. Construct the bottom system of the IPTD pile structure.
8. Construct the perimeter support system of the IPTD pile structure and place contaminated soils/sediments inside structure.
9. Install temporary cover over filled IPTD pile structure.
10. Perform Phase I site restoration activities, including backfilling of indicated excavations and grassing.
11. Treat the Phase I contaminated soils/sediments (to be performed by IPTD Contractor).

12. Quench the Phase I treated soils/sediments with water to cool, remove, and stockpile on-site.

B. Phase II

1. Clear project areas of UXO (by others).
2. Install erosion and sediment control measures around Phase II excavation areas.
3. Remove vegetation down to the ground surface.
4. Perform demolition activities in the area to be excavated.
5. Excavate and moisture condition contaminated soils/sediments. Verify the removal of contaminated material through surveys and confirmation sampling. Confirmation sampling to be performed by USAID COTR OR DESIGNATE.
6. Place contaminated soils/sediments inside IPTD pile structure.
7. Install temporary cover over filled IPTD pile structure.
8. Perform Phase II site restoration activities, including backfilling of indicated excavations and grassing.
9. Treat the Phase II contaminated soils/sediments (to be performed by IPTD Contractor).
10. Quench the Phase II treated soils/sediments with water to cool, remove, and stockpile on-site.
11. Dismantle IPTD pile structure and restore area.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The scope of this section defines the items included in each bid item in the Bid Form of these Specifications. Payment will be made based on the specified items included in the description in this section for each bid item.
- B. The items listed below, refer to and are the same pay items listed in the Bid Form. They constitute all of the pay items for the completion of the Work. No direct or separate payment will be made for providing miscellaneous temporary or accessory works, services, field offices, layout surveys, job signs, sanitary requirements, testing, safety devices, water supplies, power, maintaining traffic, removal of waste, watchmen, and all other requirements of the General Conditions and DIVISION 1 GENERAL REQUIREMENTS. Compensation for all such services, equipment and materials shall be included in the prices stipulated for the lump sum and unit pay items listed herein.
- C. Pricing for bid items requiring fill materials from borrow sources shall include borrow pit permitting (if required by federal or local regulations); borrow source erosion and sedimentation control and permits; clearing and grubbing of potential borrow areas; haul road construction; borrow pit excavation; material hauling; borrow area drainage and dewatering; sheeting and bracing; verification and location of existing buried utilities and other structures; care and protection of existing utilities and structures; and borrow pit restoration.
- D. Each lump sum and unit bid price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item. Lump sum items will be paid based on percent complete at each payment request.
- E. Repairs are not a separate pay item but are considered to be an integral part of the work under the contract, and all contract bid prices include the cost of repairs necessitated by the work related to that bid item. Repairs include existing structures and property, paving, stabilized roads, drainage piping and ditches, catch basins, head walls, yard culverts, driveways, lawns and ground areas, walkways, and irrigation systems which are altered, removed, or damaged during construction. Cleanup is an integral part of repairs.
- F. For purposes of measurement and payment, the term surface area is defined as the horizontal surface measured from a certified survey.

1.02 PAY ITEMS

TOTAL BID ITEMS: 1 – 46

A. **Item 1** – Clearing and Removal of Vegetation on Dry Land

1. Measurement: The number of hectares cleared and grubbed on dry land which will be paid for under this item will be the actual number of hectares, or partials thereof, cleared as measured by the survey. The area measurement for payment will be verified by the USAID COTR OR DESIGNATE.
2. Payment: The unit price bid per hectare for this item will be full compensation required to perform clearing and grubbing as specified herein, including but not limited to: clearing (all project areas), grubbing (non-contaminated areas), and proper disposal of cleared and grubbed material. No payment will be made for any clearing and grubbing beyond the limits of construction as shown on the Drawings, or for which certifying surveys required by Section 01050 have not been submitted and approved by the USAID COTR OR DESIGNATE.

B. **Item 2** – Clearing and Removal of Vegetation from Water Areas

1. Measurement: The number of hectares cleared from water areas which will be paid for under this item will be the actual number of hectares, or partials thereof, cleared as measured by the survey. The area measurement for payment will be verified by the USAID COTR OR DESIGNATE.
2. Payment: The unit price bid per hectare for this item will be full compensation required to perform clearing as specified herein, including but not limited to: clearing, and proper disposal of cleared and grubbed material. No payment will be made for any clearing beyond the limits of construction as shown on the Drawings, or for which certifying surveys required by Section 01050 have not been submitted and approved by the USAID COTR OR DESIGNATE.

C. **Item 3** – Demolition

1. The lump sum price for demolition, removal and disposal of the existing concrete covering over the MLA, sediment basins in the SA, walls, fences, asphalt paving in the IPTD pile structure and drainage ditch areas, structures located in the SA, and miscellaneous debris and structures to complete the Work shall be for full compensation for all labor, tools, equipment, supervision and incidentals for the Work as shown on the Drawings.

D. **Item 4** – Erosion and Sediment Control

1. The lump sum price for Sediment and Erosion control measures shall be full compensation to furnish and maintain temporary sedimentation and erosion control measures as shown in the Drawings or otherwise required for adequate control of sedimentation from the site, and specified herein, including controls for structures, facilities, stockpiles, ditches, and roadways. Control measures

shall include, but not be limited to: silt fences; turbidity barriers; soil tracking prevention devices; riprap; and shall conform to the requirements of the Specifications, Drawings, and applicable Vietnamese or local regulations.

E. Items 5 to 10 – Excavation, Hauling, and Placement of Soils and Sediments for Phase I

1. **Measurement:** The quantity of material that is excavated from the Phase I areas, hauled, and placed in the IPTD pile structure which will be paid for under this item will be the actual number of cubic meters measured by comparing the topographic survey performed after clearing to the topographic survey performed upon the completion of excavation. The volume measurement for payment will be verified by the USAID COTR OR DESIGNATE.
2. **Payment:** The unit price bid for this item will be full compensation required to perform excavation, hauling, and placement as shown on the Drawings and specified herein, including but not limited to: excavation; surface drainage control; dewatering of excavations; sheeting and bracing; moisture conditioning of excavated material; hauling; backfill; compaction and all other work required for or incidental to the satisfactory completion of all Work under this contract for which payment is not provided under other items in the bid form. No payment will be made for any excavation, hauling, or placement for which certifying surveys required by Section 01050 have not been submitted and approved by the USAID COTR OR DESIGNATE.

F. Item 11 – Dewatering Demonstration

1. The lump sum price for conducting a dewatering demonstration to exhibit that the technique for dewatering of excavated material will be sufficient in draining excess water to meet the specified moisture content shall be for full compensation for all labor, tools, equipment, materials, supervision and incidentals for the Work as shown on the Drawings and specified herein. The CONTRACTOR shall propose the demonstration area dimensions and quantity of sediment needed to conduct the demonstration to the USAID COTR OR DESIGNATE.

G. Items 12 and 18 – Dewatering of Soils and Sediments

1. The lump sum price for dewatering of soils and sediments shall be for full compensation for all labor, tools, equipment, materials, supervision and incidentals for the Work as shown on the Drawings and specified herein, including, but not limited to design, furnishing materials, installing, operating, monitoring, maintaining, and removing a temporary dewatering pad.

H. Items 13 to 17 – Excavation, Hauling, and Placement of Soils and Sediments for Phase II

1. **Measurement:** The quantity of material that is excavated from the Phase II areas, hauled, and placed in the IPTD pile structure which will be paid for under this item will be the actual number of cubic meters measured by comparing the

topographic survey performed after clearing to the topographic survey performed upon the completion of excavation. The volume measurement for payment will be verified by the USAID COTR OR DESIGNATE.

2. Payment: The unit price bid for this item will be full compensation required to perform excavation, hauling, and placement as shown on the Drawings and specified herein, including but not limited to: excavation; surface drainage control; dewatering of excavations; sheeting and bracing; moisture conditioning of excavated material; hauling; backfill; compaction and all other work required for or incidental to the satisfactory completion of all Work under this contract for which payment is not provided under other items in the bid form. No payment will be made for any excavation, hauling, or placement for which certifying surveys required by Section 01050 have not been submitted and approved by the USAID COTR OR DESIGNATE.

I. Item 19 – Stripping and Surface Preparation

1. Measurement: The number of hectares stripped of topsoil and unsuitable material which will be paid for under this item will be the actual number of hectares, or partials thereof, removed of topsoil and unsuitable material as measured by the survey. The area measurement for payment will be verified by the USAID COTR OR DESIGNATE.
2. Payment: The unit price bid per hectare for this item will be full compensation required to perform topsoil and unsuitable material removal as specified herein, including but not limited to: topsoil and unsuitable material removal and its proper disposal or stockpiling. No payment will be made for any removal of topsoil or unsuitable material beyond the limits of construction as shown on the Drawings, or for which certifying surveys required by Section 01050 have not been submitted and approved by the USAID COTR OR DESIGNATE.

J. Item 20 – Fill Placement

1. Measurement: The quantity of fill material that is placed to construct the site access road and IPTD pile laydown area which will be paid for under this item will be the actual number of in-place cubic meters measured by comparing the topographic survey performed after clearing and removal of contaminated material to the topographic survey performed upon the completion of fill placement. The volume measurement for payment will be verified by the USAID COTR OR DESIGNATE.
2. Payment: The unit price bid for this item will be full compensation required to perform fill placement as shown on the Drawings and specified herein, including but not limited to: obtaining material from off-site borrow sources; hauling; placement; compaction; drainage and dewatering; sheeting and bracing; and all other work required for or incidental to the satisfactory completion of all Work under this contract for which payment is not provided under other items in the bid form. No payment will be made for any fill placement for which certifying

surveys required by Section 01050 have not been submitted and approved by the USAID COTR OR DESIGNATE.

K. Item 21 – Crushed Stone Road Surfacing

1. Measurement: The quantity of road surfacing to be paid for this item will be the actual number of square meters of stone road, including the IPTD pile laydown area and access ramps, constructed as measured in surface area. The area measurement for payment will be verified by the USAID COTR OR DESIGNATE.
2. Payment: The unit price per square meter for the subdivisions of this item shall be full compensation to furnish and install the stone paved access road including but not limited to: aggregate; subbase preparation; and all other appurtenances as required for which payment is not provided under other items in the bid form.

L. Item 22 – 1-meter Diameter RCP Stormwater Pipes

1. Measurement: The quantity of 1-meter diameter reinforced concrete pipe (RCP) to be paid for under the subdivisions of this item will be the actual number of linear meters of pipe in place measured horizontally along the centerline of the installed pipes.
2. Payment: The unit price bids per linear meter for the subdivisions of this item will be full compensation for furnishing and installing designated pipe as shown on the Drawings and specified herein, including but not limited to: bedding; trench excavation; compacting; and backfilling; and all else incidental to the work for which payment is not provided under other items in the bid form. No payment will be made for areas in which certifying surveys required by Section 01050 have not been submitted and approved by the USAID COTR OR DESIGNATE.

M. Item 23 – Rock Rip Rap (Type B) Aprons for Pipe Ends

1. Measurement: The quantity of rock rip rap aprons to be paid under the subdivisions of this item will be the number of square meters of rip rap delivered and installed as shown on the Drawings and specified herein.
2. Payment: The unit price bid per square meter for the subdivisions of this item will be full compensation to furnish and install rip rap outlet aprons, including but not limited to: rock rip rap; bedding stone; finish grading; and all other appurtenances for which payment is not provided under other items in the bid form.

N. Item 24 – Security Fencing

1. Measurement: The quantity of security fencing to be paid for under this item will be the actual number of linear meters of new fence as measured along the

horizontal centerline of the fence with no deduction for poles and supports. Measurement will be to the nearest tenth of a meter of fence.

2. Payment: The unit price bid per linear meter for this item shall be full compensation to furnish and install the security fence, including but not limited to: 3-strand barb wire; concrete footings; and all other appurtenances as identified in the Drawings and as specified herein for which payment is not provided under other items in the bid form.

O. Item 25 – Security Gates

1. Measurement: The quantity of security fence double swing gates to be paid for under this item will be the actual number of new double swing gates as accepted by the USAID COTR OR DESIGNATE.
2. Payment: The unit price bid for this item shall be full compensation to furnish and install double swing gate, including but not limited to: 3-strand barb wire; concrete footing; and all other appurtenances as identified in the Drawings and as specified herein for which payment is not provided under other items in the bid form.

P. Item 26 – 30-cm Thick Gravel Subbase

1. Measurement: The quantity of gravel subbase to be paid for this item will be the actual number of square meters of gravel as measured in surface area. The area measurement for payment will be verified by the USAID COTR OR DESIGNATE.
2. Payment: The unit price per square meter for the subdivisions of this item shall be full compensation to furnish and install the gravel subbase including but not limited to: aggregate; subbase preparation; HDPE liner barrier; and all other appurtenances as required for which payment is not provided under other items in the bid form.

Q. Item 27 – 60-cm Thick Lightweight Insulating Concrete Bottom

1. Measurement: The quantity of lightweight insulating concrete bottom to be paid for under this item will be the actual square meters of lightweight concrete installed as measured by the survey. The area measurement for payment will be verified by the USAID COTR OR DESIGNATE.
2. Payment: The unit price for lightweight insulating concrete bottom shall be full compensation for all labor, tools, equipment, supervision, surveying, and incidentals required to furnish and install the lightweight concrete as shown on the Drawings. Installation includes, but is not limited to, subbase preparation, formwork, providing and placing lightweight concrete, concrete finishing and repairs, curing, and all other appurtenances or Work under this contract for which payment is not provided under other items in the bid form.

R. **Item 28** – 15-cm Thick Concrete Slab Overlay

1. Measurement: The quantity of concrete slab to be paid for under this item will be the actual square meters of concrete installed as measured by the survey. The area measurement for payment will be verified by the USAID COTR OR DESIGNATE.
2. Payment: The unit price for concrete slab overlay shall be full compensation for all labor, tools, equipment, supervision, surveying, and incidentals required to furnish and install the lightweight concrete as shown on the Drawings. Installation includes, but is not limited to, subbase preparation, formwork, providing and placing concrete, reinforcement, concrete finishing and repairs, curing, and all other appurtenances or Work under this contract for which payment is not provided under other items in the bid form.

S. **Item 29** – 30-cm Thick Leachate Collection System Aggregates

1. Measurement: The quantity of leachate collection system aggregates to be paid for this item will be the actual number of square meters of the leachate collection system as measured in surface area. The area measurement for payment will be verified by the USAID COTR OR DESIGNATE.
2. Payment: The unit price bid per square meter for the subdivisions of this item will be full compensation to furnish and install the leachate collection system, including but not limited to: crushed stone; filter sand; finish grading; and all other appurtenances for which payment is not provided under other items in the bid form.

T. **Item 30** – 15-cm Diameter Leachate Collection Piping

1. Measurement: The quantity of leachate pipes to be paid for under the subdivisions of this item will be the actual number of linear meters of pipe, both perforated and non-perforated, in place measured horizontally along the centerline of the installed pipes.
2. Payment: The unit price bids per linear meter for the subdivisions of this item will be full compensation for furnishing and installing designated pipe as shown on the Drawings and specified herein, including but not limited to: fittings; caps; plugs; flanges; couplings; bolts; pipe supports; valves; stone bedding; pipe testing; and all else incidental to the work for which payment is not provided under other items in the bid form. No payment will be made for areas in which certifying surveys required by Section 01050 have not been submitted and approved by the USAID COTR OR DESIGNATE.

U. **Item 31** – 1.5-m Diameter Leachate Precast Concrete Manholes

1. Measurement: The quantity of precast concrete manholes to be paid for under this item will be the actual number of manholes installed.

2. Payment: Payment for furnishing and installing concrete manholes complete in place will be made for each manhole installed, which price and payment shall be full compensation for all excavation, backfilling, for furnishing and installing precast sections and bases, platforms, manhole rungs, frames and covers, screened gravel subbase, all forms, reinforcing, concrete and masonry materials, and all else incidental thereto, for which separate payment is not provided under other items in the bid form.

V. **Item 32** – Concrete Masonry Wall System

1. Measurement: The quantity of concrete masonry wall system to be paid for under the subdivisions of this item will be the actual number of linear meters of wall in place measured horizontally along the centerline at the top of the wall.
2. Payment: The unit price for the concrete masonry wall system shall be full compensation for all labor, tools, equipment, supervision, surveying, and incidentals required to furnish and install the wall as shown on the Drawings. Installation includes, but is not limited to, subbase preparation, providing and placing concrete masonry blocks, repairs, curing, and all other appurtenances or Work under this contract for which payment is not provided under other items in the bid form.

W. **Item 33** – Perimeter Wall Insulation

1. Measurement: The quantity of perimeter wall insulation will be the actual number of square meters of insulation in place as measured vertically in surface area. The area measurement for payment will be verified by the USAID COTR OR DESIGNATE.
2. Payment: The unit price bid per square meter for this item will be full compensation required to perform all work required to complete the installation of the perimeter wall insulation as shown on the Drawings and specified herein including, but not limited to: materials, installation; HDPE liner barrier; and all else incidental to the satisfactory completion of the work for which payment is not provided under other items in the bid form.

X. **Item 34** – Sheet Metal Containment and Support for Perimeter Wall Insulation

1. Measurement: The quantity of sheet metal containment and support for the perimeter wall insulation will be the actual number of square meters of sheet metal in place as measured vertically in surface area. The area measurement for payment will be verified by the USAID COTR OR DESIGNATE.
2. Payment: The unit price bid per square meter for this item will be full compensation required to perform all work required to complete the installation of the sheet metal containment and support for the perimeter wall insulation as shown on the Drawings and specified herein including, but not limited to: materials, installation; attachment to concrete masonry wall and floor; and all

else incidental to the satisfactory completion of the work for which payment is not provided under other items in the bid form.

Y. Item 35 – Fill Placement for Access Ramps

1. **Measurement:** The quantity of material that is placed to construct the access ramps to the top of the IPTD pile structure which will be paid for under this item will be the actual number of cubic meters measured by comparing the topographic survey performed after constructing the IPTD pile laydown area to the topographic survey performed upon the completion of fill placement. The volume measurement for payment will be verified by the USAID COTR OR DESIGNATE.
2. **Payment:** The unit price bid for this item will be full compensation required to perform fill placement as shown on the Drawings and specified herein, including but not limited to: obtaining material from off-site borrow sources; hauling; placement; compaction; drainage and dewatering; sheeting and bracing; and all other work required for or incidental to the satisfactory completion of all Work under this contract for which payment is not provided under other items in the bid form. No payment will be made for any fill placement for which certifying surveys required by Section 01050 have not been submitted and approved by the USAID COTR OR DESIGNATE.

Z. Items 36 and 37 – Quenching, Removing, and Stockpiling of Treated Soils and Sediments

1. **Measurement:** The quantity of treated soils and sediments that is quenched and removed from the IPTD pile structure following each treatment phase and stockpiled on-site will be the actual number of cubic meters measured by comparing the topographic survey performed after treatment to the topographic survey performed upon the completion of removal. The volume measurement for payment will be verified by the USAID COTR OR DESIGNATE.
2. **Payment:** The unit price bid for this item will be full compensation required to perform quenching, excavation, hauling, and stockpiling as shown on the Drawings and specified herein, including but not limited to: application of water to quench the treated soils/sediments; excavation; drainage and dewatering; sheeting and bracing; hauling; stockpiling; and all other work required for or incidental to the satisfactory completion of all Work under this contract for which payment is not provided under other items in the bid form. No payment will be made for any excavation, hauling, or placement for which certifying surveys required by Section 01050 have not been submitted and approved by the USAID COTR OR DESIGNATE.

AA. Item 38 – Dismantling of IPTD Pile Structure at Completion of Project

1. The lump sum price for dismantling, removal and disposal of the IPTD pile structure and all other incidentals to complete the Work shall be for full

compensation for all labor, tools, equipment, supervision and incidentals for the Work as shown on the Drawings.

BB. Items 39 and 41 – Backfilling of Excavations for Phase I and Phase II

1. Measurement: The quantity of material that is placed to backfill excavation areas for Phase I and Phase II which will be paid for under this item will be the actual number of cubic meters measured by comparing the topographic survey performed after removal of contaminated material to the topographic survey performed upon the completion of fill placement. The volume measurement for payment will be verified by the USAID COTR OR DESIGNATE.
2. Payment: The unit price bid for this item will be full compensation required to perform backfilling as shown on the Drawings and specified herein, including but not limited to: obtaining material from off-site borrow sources; hauling; placement; compaction; drainage and dewatering; sheeting and bracing; and all other work required for or incidental to the satisfactory completion of all Work under this contract for which payment is not provided under other items in the bid form. No payment will be made for any fill placement for which certifying surveys required by Section 01050 have not been submitted and approved by the USAID COTR OR DESIGNATE.

CC. Items 40 and 42 – Seeding and Mulching for Phase I and Phase II

1. Measurement: The number of hectares of Seeding and Mulching that will be measured for payment under this item will be based upon the actual in-place quantity as measured by computing the surface area of the seeded and mulched area limits from the survey as required in Section 01050, and as accepted by the USAID COTR OR DESIGNATE.
2. Payment: The unit price bid per hectare for this item will be full compensation for performing seeding and mulching, the addition of soil amendments and matting, and maintenance as specified herein for which payment is not provided under other items in the bid form. No payment will be made for seeded and mulched areas until the establishment of a sufficient growth of grass as examined and approved by the USAID COTR OR DESIGNATE and certifying surveys required by Section 01050 have been submitted and approved by the USAID COTR OR DESIGNATE.

DD. Item 43 – Equipment Decontamination

1. The lump sum price for equipment decontamination under this item shall be full compensation for all labor, materials, tools, equipment, supervision, and incidentals necessary for installing, operating, and maintaining equipment decontamination through the use of dedicated decontamination stations and/or temporary/portable facilities.

EE. Item 44 – Miscellaneous Work and Cleanup

1. The lump sum price for Miscellaneous Work and Clean-up shall be full compensation to perform the work specified in Section 02901 of the Specifications and as shown on the Drawings, and any other work not specifically included for payment under any other item but obviously necessary to complete the Contract. Partial payments will be based on the breakdown of the item as required in Section 02901. The lump sum price shall include, but not limited to, full compensation for Construction Schedules as required by Section 01310, all construction photographs as required by Section 01390, Project record documents as required by Section 01720, and traffic control.

FF. Item 45 – Bonds, Mobilization, and Insurance

1. Measurement: This item will be based on actual invoice amounts to substantiate the actual insurance premiums and other invoiced costs, as well as an allowance for mobilization/demobilization.
2. Payment: This item will be made at the applicable lump sum amount, as above determined, and will represent full compensation for providing the required insurance and mobilization/demobilization in accordance with the requirements of the General Conditions.

GG. Item 46 – Contingency

1. The contingency allowance is to provide payment for unforeseen conditions which may be encountered in the work and is to be used only upon written work order from the USAID COTR OR DESIGNATE. The contingency allowance shall be a fixed percentage of the base bid as specified on the form.

1.03 SUPPLEMENTARY UNIT PRICE ITEMS

TOTAL BID ITEMS 47 – 48

A. Item 47 – Treatment of Water from Excavation Dewatering

1. Measurement: The quantity of water treated from excavation dewatering will be the actual number of cubic meters treated.
2. Payment: If testing indicates that water being removed from excavations are above the project action levels identified in the Site-Wide Sampling and Analysis Plan, the water shall be treated or disposed. The unit price bid per cubic meter for this item will be full compensation required to perform all work required to treat or dispose of the water including, but not limited to: materials, installation; operation; and all else incidental to the satisfactory completion of the work for which payment is not provided under other items in the bid form.

B. Item 49 – Treatment of Water from Soil and Sediment Dewatering

1. Measurement: The quantity of water treated from soil and sediment dewatering will be the actual number of cubic meters treated.

2. Payment: If testing indicates that water draining from the soils and sediments are above the project action levels identified in the Site-Wide Sampling and Analysis Plan, the water shall be treated or disposed. The unit price bid per cubic meter for this item will be full compensation required to perform all work required to treat or dispose of the water including, but not limited to: materials, installation; operation; and all else incidental to the satisfactory completion of the work for which payment is not provided under other items in the bid form.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01041

PROJECT COORDINATION

PART 1 GENERAL

1.01 WORK PROGRESS

- A. The CONTRACTOR shall furnish personnel and equipment which will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress which will ensure the completion of the work within the time stipulated in the Contract Specifications. If at any time such personnel appears to the USAID COTR OR DESIGNATE to be inefficient, inappropriate or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, he may order the CONTRACTOR to increase the efficiency, change the character or increase the personnel and equipment, and the CONTRACTOR shall conform to such order. Failure of the USAID COTR OR DESIGNATE to give such order shall in no way relieve the CONTRACTOR of his obligations to secure the quality of the work and rate of progress.

1.02 PRIVATE LAND

- A. The CONTRACTOR shall not enter or occupy land outside of work areas indicated on the drawings, except by permission of the Airport.

1.03 WORK LOCATIONS

- A. Structures shall be located substantially as indicated on the Drawings, but the USAID COTR OR DESIGNATE reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons.

1.04 OPEN EXCAVATIONS

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons and damage to property. The CONTRACTOR shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by the public and workers.

1.05 TEST PITS

- A. Test pits for the purpose of locating underground pipeline or structures in advance of the construction shall be excavated and backfilled by the CONTRACTOR. Test pits shall be backfilled immediately after their purpose has been satisfied and maintained in a manner satisfactory to the USAID COTR OR DESIGNATE. The costs for such test pits shall be borne by the CONTRACTOR.

1.06 MAINTENANCE OF ACCESS

- A. CONTRACTOR shall maintain access to other contractors and airport personnel through the provision of two free lanes available for all traffic.

1.07 MAINTENANCE OF TRAFFIC

- A. Open pits, trenches, debris, or other obstructions due to construction that will prevent the normal flow of traffic during an extended construction stoppage, for any reason, shall be minimized. In the event an extended construction stoppage is found to be necessary, CONTRACTOR shall, at his own expense, provide normal traffic flow during extended construction stoppage. Extended stoppage will be defined by the USAID COTR OR DESIGNATE.
- B. All excavated material shall be placed so that vehicular and pedestrian traffic may be maintained at all times. If the CONTRACTOR's operations cause traffic hazards, the CONTRACTOR shall repair the road surface, provide temporary roadways, erect wheel guards or fences, or take other measures for safety satisfactory to the USAID COTR OR DESIGNATE.
- C. Detours around construction areas will be subject to the approval of the USAID COTR OR DESIGNATE. Where detours are permitted, the CONTRACTOR shall provide all necessary barricades and signs as required to divert the flow of traffic. While traffic is detoured, the CONTRACTOR shall expedite construction operations and periods when traffic is being detoured will be strictly controlled by the USAID COTR OR DESIGNATE.
- D. Any traffic maintenance measures the CONTRACTOR is going to implement during construction should be consistent with local transportation department standards and regulations.
- E. CONTRACTOR shall coordinate all construction traffic in and out of the site, and within the airport property with the Airport.
- F. Refer to the Remediation Work Plan for additional Site-Wide Traffic Control Plan requirements.

1.08 WATER FOR CONSTRUCTION PURPOSES

- A. Water is available onsite as needed for construction and dust control. CONTRACTOR shall coordinate with USAID COTR OR DESIGNATE for water usage.

1.09 MAINTENANCE OF FLOW

- A. The CONTRACTOR shall at his own cost, provide for the flow of water, sewer, drains, and water courses interrupted during the progress of the Work. The entire procedure of maintaining existing flow shall be fully discussed with the USAID COTR OR DESIGNATE well in advance of the interruption of any flow.

1.10 CONNECTION TO WORK BY OTHERS

- A. Construction by others may occur at the same time and on the same areas as work being done under this Contract. The CONTRACTOR will, therefore, conduct his operations to interface with other contractors and related work.

1.11 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

- A. The CONTRACTOR shall assume full responsibility for the protection of all structures and utilities, public or private, including poles, signs, utility services such as electric and telephone cables that are not shown on the Drawings for demolition. The CONTRACTOR shall carefully support and protect all such structures and utilities from injury of any kind. Any damage resulting from the CONTRACTOR's operations shall be repaired by CONTRACTOR at CONTRACTOR's expense.
- B. If relocation of a privately owned utility is required, CONTRACTOR shall notify the Utility to perform the work as expeditiously as possible. The CONTRACTOR shall fully cooperate with the Utility and shall have no claim for delay due to such relocation. The CONTRACTOR shall notify all utility companies and the USAID COTR OR DESIGNATE in writing at least 72 hours (excluding Saturdays, Sundays and Legal holidays) before excavating in any public way.

PART 2 PRODUCTS

2.01 PROTECTION OF CONSTRUCTION AND EQUIPMENT

- A. All newly constructed work shall be carefully protected from injury in any way. No wheeling or walking or placing of heavy loads on it shall be allowed and all portions injured shall be reconstructed by the CONTRACTOR at his own expense.
- B. All structures shall be protected in a manner approved by the USAID COTR OR DESIGNATE. Should any of the surfaces or other parts of the structures become heaved, cracked or otherwise damaged, all such damaged portions of the work shall be completely repaired and made good by the CONTRACTOR at his own expense and to the satisfaction of the USAID COTR OR DESIGNATE. If, in the final inspection of the work, any defects, faults or omissions are found, the CONTRACTOR shall cause the same to be repaired or removed and replaced by proper materials and workmanship without extra compensation for the materials and labor required. Further, the CONTRACTOR shall be fully responsible for the satisfactory maintenance and repair of the construction and other work undertaken herein, for at least the guarantee period described in the contract.
- C. The CONTRACTOR shall maintain the work during construction and until the project is accepted. This maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces to the end that the road or structures are kept in satisfactory condition at all times.
- D. All cost of maintenance work during construction and before the project is accepted shall be included in the unit prices bid on the various pay items and the CONTRACTOR will not be paid an additional amount for such work.

2.02 FAILURE TO MAINTAIN ROADWAY OR STRUCTURE

- A. If the CONTRACTOR, at any time, fails to comply with the provisions of Paragraph 2.01, the USAID COTR OR DESIGNATE will immediately notify the CONTRACTOR

of such non-compliance. If the CONTRACTOR fails to remedy the unsatisfactory maintenance within 24 hours after receipt of such notice, the USAID COTR OR DESIGNATE will immediately proceed to maintain the project, and the entire cost of his maintenance will be deducted from the monies due or to become due the CONTRACTOR on his Contract.

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01050

FIELD ENGINEERING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. CONTRACTOR shall provide certified survey work required in execution of the Project. The term "certified" as used throughout this Section shall mean work by a surveyor registered to practice in Da Nang, Vietnam.
- B. Provide civil, structural, or other professional engineering services specified or required to execute Contractor's construction methods.
- C. Provide Record Drawings to be used for recovering quantities and documenting construction. All Record Drawings shall be AutoCAD Release 2008 format as specified in the following Sections.
- D. The CONTRACTOR shall retain the services of a professional land surveyor licensed for Da Nang, Vietnam to perform all surveying.
- E. The USAID COTR OR DESIGNATE shall provide AutoCAD files and standards for Record Drawings that are to be maintained by the CONTRACTOR. The CONTRACTOR will be required to sign and submit the AutoCAD Disclaimer Form at the end of this Section before receiving the AutoCAD files.
- F. As a condition for reaching substantial completion, submit certified drawings with complete AutoCAD files signed and sealed by a Professional Land Surveyor.

1.02 RELATED REQUIREMENTS

- A. The Contract Documents include, but are not limited to, the following related sections:
 - 1. Summary of Work is included in Section 01010.
 - 2. Measurement and Payment are included in Section 01025.
 - 3. Applications for Payment are included in Section 01152.
 - 4. Project Record Documents are included in Section 01720.

1.03 SUBMITTALS

- A. Submit name, address, and copy of license of professional land surveyor to be used on this project to the USAID COTR OR DESIGNATE within 15 days of the Notice to Proceed.

- B. Submit certificate with each submittal signed by a Professional Land Surveyor certifying that elevations and locations of new work and improvements are in conformance or non-conformance with the Contract Documents.
- C. The CONTRACTOR is required to submit surveys prepared, signed and sealed by a registered land surveyor. All surveys shall be tied to VN-2000 Coordinate System and elevations Hon Dau – Hai Phong. These drawings shall constitute the project record documents. The CONTRACTOR shall submit each survey on Mylar, along with 5 prints, and on a compact disk (CD) in AutoCAD Release 2008 format. All information in the AutoCAD file must be at appropriate 3-D elevation and coordinate. All entities shall be placed on layer names which adequately describe the entity being mapped.
- D. The CONTRACTOR's surveyor is required to perform, and submit to the USAID COTR OR DESIGNATE the following types of surveys:
 - 1. Certified aerial and field topographic map surveys and Digital Terrain Models (DTM) shall be performed at the following stages of the removal of contaminated soils and sediments:
 - a. Immediately following clearing and prior to starting excavation of contaminated soils and sediments.
 - b. Immediately following completion of excavation of contaminated soils/sediments as determined by confirmation sampling.
 - c. Immediately following backfilling of excavations.
 - 2. Certified Surveys for Contaminated Soil and Sediment Removal

A Certified Survey providing the horizontal limits of excavation resulting from the removal of contaminated soils and sediments. Additionally, certified grid surveys shall be provided that show the elevations at each of the following stages: the surface elevations following clearing of surface vegetation; the bottom surface of excavations following the removal of contaminated material as verified by confirmation sampling and approved by the USAID COTR OR DESIGNATE; and the finish grade of areas receiving fill materials as part of site restoration. The grid survey shall be performed at a minimum spacing of 10-meter centers throughout and at breaks-in-grade. The grid survey shall utilize identical horizontal points for each stage of survey. An excavation shall not be filled with fill material or considered to be complete until a certified survey is submitted and approved by the USAID COTR OR DESIGNATE that the excavation elevations conform to the depth removal requirements shown on the Project Drawings. Final approval shall not be provided until a certified survey is submitted and approved by the USAID COTR OR DESIGNATE that the excavation depth meets the minimum required depth at all grid points or as otherwise modified by confirmation sampling.

CONTRACTOR shall submit an individual certified survey for each state (i.e., cleared surface, bottom of excavation, and top of restored surface). Each survey

shall contain the elevation data for the previous subsurface(s) at each 10-meter grid point. The elevation data provided for each 10-meter grid point shall be presented to the hundredth of a meter.

3. A Certified “As-Built” Survey of the surface and subsurface structures (including topography) installed by the CONTRACTOR after completion of the project and shall include the following:
 - a. Surface Facilities - Including, but not limited to: limits of new access road, manholes, piping, pumps, channels, ponds, riprap aprons and outlets, seeding and mulching, fencing and gates, utility poles, IPTD laydown area and structure (after each phase of construction and filling), and stockpiles of treated soil/sediment.
 - b. Subsurface Facilities – Including, but not limited to: concrete pipe, metal pipe, location of drop manholes (including invert elevations elevation), and buried utilities installed as part of the Work.
4. Provide topographic surveys and volume estimates for items identified on the Bid Form and for submittal with pay applications.

E. The surveys shall meet the following criteria:

- a. Reproducible plot of 1:500
- b. Produced at national map accuracy standards for 1:500 scale maps with 0.5-meter contour intervals.
- c. The DTM must contain adequate 3-D points and 3-D breaklines required to accurately model the photographed or surveyed surface to within above stated accuracy. The DTM must also provide a 2-D polyline defining the limits of the area surveyed. The points, breaklines, and survey limits line shall be on separate layers. The AutoCAD file of the DTM model must be compatible for use with Civil3D or Land Development Desktop software.

1.04 QUALIFICATIONS OF SURVEYOR OR ENGINEER

- A. Registered Professional Land Surveyor shall currently be licensed locally.

1.05 SURVEY REFERENCE POINTS

- A. Locate and protect control points prior to starting site work and preserve all permanent reference points during construction.
 1. Make no changes or relocations without prior written notice to and concurrence of the USAID COTR OR DESIGNATE.

2. Report to the USAID COTR OR DESIGNATE when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
3. Require surveyor to correctly replace project control points which may be lost or destroyed. Establish replacements based on original survey control.

1.06 PROJECT SURVEY REQUIREMENTS

- A. Establish a minimum of two permanent bench marks on site, referenced to data established by survey control points. Record locations, with horizontal and vertical data, on Project Record Documents.
- B. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means:
 1. Site improvements
 - a. Stakes for excavations, grading, and fill placement.
 - b. Utility slopes and invert elevations.
- C. From time to time, verify layouts by same methods.
- D. Establish all lines and grades prior to construction of line work for all pipelines at 15-meter increments and at defined breaks in grade.

1.07 RECORDS

- A. Maintain a complete, accurate log of all control and survey work as it progresses.
- B. Update the Project Record Drawings on a monthly basis based on the work performed during the month ending at the pay request as a condition for approval of monthly progress payment requests.
- C. Maintain an accurate record of all changes, revisions, and modifications.
- D. All field survey notes will be retained by the Surveyor. The results from the field surveys will be documented on a set of Survey Record (As-Built) Drawings signed and sealed by a professional land surveyor meeting local licensing requirements. The CONTRACTOR shall certify to the USAID COTR OR DESIGNATE that the results of the survey demonstrates compliance with the Contract Documents. These drawings shall, at a minimum, show the final elevations and locations of all surfaces and appurtenances surveyed.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

AUTOCAD DISK COPY
DISCLAIMER

As an accommodation to _____ (CONTRACTOR), USAID COTR OR DESIGNATE agrees to provide CONTRACTOR an electronic copy of the AutoCAD disk used to develop the Conformed Contract Drawings (Drawing Nos. _____ through _____) for the Environmental Remediation at Da Nang Airport Project. The information contained may include all information which is shown on the Conformed Contract Drawings. CONTRACTOR is aware of the potential errors that may arise through the electronic copying of the AutoCAD disk.

This AutoCAD disk is provided to CONTRACTOR as is and CONTRACTOR may use this AutoCAD disk for the construction of the Environmental Remediation at Da Nang Airport Project. Any use on any other project is strictly prohibited. The copyright of information contained on this disk shall remain with USAID.

USAID, makes no warranties, expressed or implied, including merchantability or fitness for the particular purpose relating to the accuracy or completeness of the information contained on this disk itself or the subsequent use of the information contained on this disk.

Acknowledgment by CONTRACTOR:

Name (printed): _____

Title: _____

Signature: _____

Dated: _____

END OF SECTION

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SECTION 01095

REFERENCE STANDARDS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Abbreviations and acronyms used in Contract Documents to identify reference standards.

1.02 QUALITY ASSURANCE

- A. Application: When a standard is specified by reference, comply with requirements and recommendations stated in that standard, except when requirements are modified by the Contract Documents, or applicable codes establish stricter standards.
- B. Publication Date: The publication in effect on the date of issue of Contract Documents, except when a specific publication date is specified.

1.03 ABBREVIATIONS, NAMES, AND ADDRESSES OF ORGANIZATIONS

- A. Obtain copies of referenced standards direct from publication source, when needed for proper performance of Work, or when required for submittal by Contract Documents.

AASHTO American Association of State Highway and Transportation Officials
444 North Capitol Street, N.W, Suite 249
Washington, DC 20001

ACI American Concrete Institute
P.O. Box 9094
Farmington Hills, MI 48333-9094

ANSI American National Standards Institute
25 West 43rd Street, 4th Fl.
New York, New York, 10036

ASTM American Society for Testing and Materials
100 Barr Harbor Drive
PO Box C700
West Conshohocken, PA 19428-2959

AWWA American Water Works Association
6666 W. Quincy Avenue
Denver, CO 80235

AWS American Welding Society
550 N.W. LeJeune Road
Miami, Florida 33126

CRSI	Concrete Reinforcing Steel Institute 933 North Plum Grove Road Schaumburg, IL 60173-4758
FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WFSIS) Washington Navy Yard, Bldg. 197 Washington, DC 20407
GSI/GRI	Geosynthetic Institute / Geosynthetic Research Institute 475 Kedron Avenue Folsom, PA 19033-1208
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077
PCI	Prestressed Concrete Institute 209 W. Jackson Blvd. Chicago, IL 60606-6938
UL	Underwriters' Laboratories, Inc. 333 Pfingsten Road Northbrook, IL 60062-2096

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01100

SPECIAL PROJECT PROCEDURES

PART 1 GENERAL

1.01 WORKMANSHIP, MATERIAL, AND EQUIPMENT

- A. When a particular product is specified or called for, it is intended and shall be understood that the proposal tendered by the CONTRACTOR included those products in the bid. Should the CONTRACTOR desire products equal to those specified, the CONTRACTOR shall furnish information as described in the Standard General Conditions. The alternate product or products submitted by the CONTRACTOR shall meet the requirements of the specifications and shall, in all respects, be equal to the products specified by name herein.
- B. All materials and manufactured articles for incorporation into the Work shall be the new and unused standard products of recognized reputable MANUFACTURERS.

1.02 RESPONSIBILITY OF CONTRACTOR

- A. The CONTRACTOR shall be responsible for the entire Work determined by the Drawings, Specifications and Contract from the start date of the Work until it is accepted as evidence of approval of the Completion Certificate by the USAID COTR OR DESIGNATE. The CONTRACTOR shall be responsible for removals, renewals and replacements due to action of the elements and all other causes except as otherwise provided in the Specifications. The Contract shall be kept under the control of the CONTRACTOR and it shall be the CONTRACTOR's responsibility to see that the Work is properly supervised and carried on faithfully and efficiently. The CONTRACTOR shall supervise the work personally or shall have a competent superintendent or representative, who shall be on the site of the project at all working hours, and who shall have the full authority of the CONTRACTOR to direct the performance of the work and make arrangement for all necessary materials, equipment and labor without delay.
- B. Renewals or repairs necessitated because of defective materials or workmanship, or due to action of the elements or other natural causes, including fire and flood and standing water, prior to the acceptance as determined by the Completion Certificate, shall be done anew in accordance with the Contract and Specifications at the expense of the CONTRACTOR.

1.03 PROVISIONS FOR CONTROL OF EROSION

- A. Sufficient precautions, in accordance with Section 02270, shall be taken during construction to prevent the run-off of polluting substances such as silt, clay, fuels, oils, bitumens, or other polluting materials harmful to humans, fish, or other life, into the supplies and surface waters. Control measures must be adequate to assure that turbidity in the receiving water will not be increased more than 29 nephelometric turbidity units (NTU) above background unless otherwise permitted. Special precautions shall be taken in the use of construction equipment to prevent operations which promote erosion.

Erosion evident within the limits of construction or other areas affected by the CONTRACTOR shall be the responsibility of the CONTRACTOR during the full term of the contract and for the full one (1) year guarantee period. Areas subject to erosion during this time shall be fully restored to original or design conditions (as applicable) within 10 days of notice to the CONTRACTOR.

- B. The CONTRACTOR shall be responsible for complying with all applicable permit conditions.

1.04 ONSITE STORAGE

- A. The CONTRACTOR is required to maintain special storage requirements and possible charges for noncompliance of onsite storage requirements for materials and equipment as specified in Section 01610. All surplus material shall be disposed of on site in the designated area.

1.05 WARRANTIES

- A. Unless specified otherwise in the Contract Documents, all materials supplied under these Specifications shall be warranted by the CONTRACTOR and the material MANUFACTURERS for a period of one (1) year. Warranty period shall commence on the date of final acceptance of the entire project by the OWNER. Warranties for installed materials will not be accepted in piecemeal.
- B. The material shall be warranted to be free from defects in workmanship, design and materials. If any part of the material should fail during the warranty period, it shall be replaced/restored at no expense to USAID.
- C. The MANUFACTURER's warranty period shall run concurrently with the CONTRACTOR's warranty or guarantee period. No exception to this provision shall be allowed.

1.06 UTILITY CROSSINGS

- A. It is intended that wherever existing utilities such as electrical or other service lines may be crossed, deflection of the pipe within recommended limits and cover shall be used to satisfactorily clear the obstruction unless otherwise indicated on the Drawings. However, when in the opinion of the USAID COTR OR DESIGNATE this procedure is not feasible they may approve the use of fittings for a utility crossing as detailed on the Drawings.

1.07 CONSTRUCTION CONDITIONS AND SUBSURFACE INVESTIGATION

- A. The CONTRACTOR shall strictly adhere to the specific requirements of the governmental unit(s) or agency(ies) having jurisdiction over the work. Wherever there is a difference in the requirements of a jurisdictional body and these Specifications, the more stringent shall apply.
- B. The CONTRACTOR shall be responsible for determining, prior to the submission of the CONTRACTOR's bid, the nature and location of the work, the conformation of the

ground, the character and quality of the substrata, the types and quantity of materials to be encountered, the nature of the groundwater conditions, the character of equipment and facilities needed preliminary to and during the prosecution of the work, the general and local conditions and all other matters which can in any way affect the work under this contract. The prices established for the work to be done will reflect all costs pertaining to the work. Any claims for extras based on substrata, groundwater table, and other such conditions will not be allowed.

1.08 PUBLIC NUISANCE

- A. The CONTRACTOR shall not create a public nuisance including but not limited to encroachment on adjacent lands, flooding of adjacent lands, or excessive noise.
- B. CONTRACTOR shall comply with any ordinance or law relating to the control and regulation of air and noise pollution. Sound level to be measured at the property line. Levels at the equipment shall not exceed 95 DBA at the equipment at any time. Sound levels in excess of this value are sufficient cause to have the work halted until equipment can be quieted to these levels. Work stoppage by the USAID COTR OR DESIGNATE for excessive noise shall not relieve the CONTRACTOR of the other portions of this specification including, but not limited to contract time and contract price.
- C. No extra charge may be made for time lost due to work stoppage resulting from the creation of a public nuisance.

1.09 SUSPENSION OF WORK DUE TO WEATHER

- A. During inclement weather, all work which might be damaged or rendered inferior by such weather conditions shall be suspended. During suspension of the work from any cause, the work shall be suitably covered and protected so as to preserve it from injury by the weather. Refer to General and Supplemental Conditions for additional requirements.

1.10 RELOCATIONS

- A. The CONTRACTOR shall be responsible for the relocation of structures, including but not limited to poles, signs, fences, conduits and drains that may interfere with the positioning of the work as set out on the Drawings. The cost of all such relocations shall be included in the bid.

1.11 PERMITS

- A. Upon notice of award, the CONTRACTOR shall immediately apply for all applicable permits not previously obtained by the USAID COTR OR DESIGNATE to do the work from the appropriate governmental agency or agencies. No work shall commence until all applicable permits have been obtained and copies delivered to the USAID COTR OR DESIGNATE. The costs for obtaining all permits shall be borne by the CONTRACTOR.
- B. The CONTRACTOR shall be responsible for any environmental impacts caused by their work and their work and shall bear the cost of all fines, penalties, engineering, legal fees

and/or additional mitigation which may be imposed by any regulatory agency due to the failure to adhere to all permit requirements.

1.12 PUMPING

- A. If dewatering is needed, a dewatering plan must be prepared and certified by a professional Engineer meeting applicable licensing and registration requirements of Vietnam, and be submitted to the USAID COTR OR DESIGNATE for approval prior to commencement of work. The CONTRACTOR shall, for the duration of the contract and with the CONTRACTOR's own equipment, pump out water which may seep or leak into the excavations or structures. Any permitted dewatering and compliance with dewatering regulations shall be the responsibility of the CONTRACTOR.
- B. The CONTRACTOR will not be allowed to pump water off-site.

1.13 EXISTING UNDERGROUND PIPING, STRUCTURES, AND UTILITIES

- A. The locations of existing underground utilities are from information obtained from the site survey. The locations are shown without express or implied representation, assurance, or guarantee that they are complete or correct or that they represent a true picture of underground piping to be encountered.

1.14 DAILY REPORTS

- A. The CONTRACTOR shall submit daily reports of construction activities, including non-work days. The report shall include:
 - 1. Manpower, number of employees by craft;
 - 2. Equipment on the project;
 - 3. Major deliveries;
 - 4. Activities work with reference to the schedule activity numbers;
 - 5. New problems; and
 - 6. Other pertinent information.
- B. A similar report shall be submitted for/by each Subcontractor.
- C. The reports shall be submitted to the USAID COTR OR DESIGNATE within two days of the respective report date. Each report shall be signed by the CONTRACTOR's Superintendent or Project Manager.

1.15 CLEAN-UP AND DUST CONTROL

- A. At all times during the prosecution of the work, the CONTRACTOR shall maintain sufficient forces to clean up and control dust as specified in Section 01005 and 01110. Control of blowing litter caused by the CONTRACTOR shall be the responsibility of the CONTRACTOR.

1.16 DAMAGE ON ACCOUNT OF HIGH WATER

- A. CONTRACTOR shall be responsible for all damages to the project area as a result of rainfall events. CONTRACTOR shall take all reasonable precautions to secure the work area against such potential damages due to rainfall.

1.17 REMEDIATION WORK PLAN

- A. The CONTRACTOR shall adhere to the Remediation Work Plan, which provides guidance for the planned remediation and defines the roles and responsibilities of all project entities and personnel. The Remediation Work Plan will serve as a guidance document as remediation proceeds.

1.18 HEALTH AND SAFETY

- A. The CONTRACTOR shall adhere to the requirements presented in the Site Health and Safety Plan and in the Contract Documents. All Work performed shall be done in accordance with an appropriate Health and Safety Plan developed by the CONTRACTOR. This program shall insure adequate protection for his personnel.

1.19 SAMPLING

- A. The Site-Wide Sampling and Analysis Plan describes the sampling objectives, locations, measurement methods, and data quality objectives for the Project. The CONTRACTOR shall conduct the sampling identified as their responsibility and shall accommodate and provide access to the USAID COTR OR DESIGNATE to conduct their sampling.

1.20 ITEMS SPECIFIED ON DRAWINGS

- A. Items of material, equipment, machinery and the like may be specified on the Drawings and not in the specifications. Such items shall be provided by the CONTRACTOR in accordance with the Specification on the Drawings.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

MANUFACTURER'S CERTIFICATE OF INSTALLATION

TESTING AND INSTRUCTION

Client _____

Project _____

Contract No. _____

SPECIFICATION SECTION _____

ITEM DESCRIPTION _____

I _____, Authorized Representative
(Print Name)

of _____
(Print Manufacturer's Name)

hereby CERTIFY that _____
(Print Name of Item and Material Manufacturer No.)

installed for the subject project has (have) been installed in a satisfactory manner, has (have) been satisfactorily tested, is (are) ready for operation.

Date _____ Time _____

CERTIFIED BY: _____ DATE: _____
(Signature of Manufacturer's Representative)

WARRANTY FOR ITEM

LOCATION OF PROJECT: _____

OWNER: _____

PROJECT NO.: _____

ITEM: _____

SECTION NO. AND/ ITEM NO.: _____

SUPPLIER: _____

SUPPLIER'S ADDRESS: _____

SUPPLIER'S REFERENCE NO.: _____

The undersigned guarantees that the above is of good merchantable quality, free from defects in material or workmanship, fully meets the type, quality, design and performance requirements defined in the Contract Specifications of the above Project, and that the equipment will in actual operation satisfactorily perform the functions for which installed.

The undersigned agrees to repair, replace, or otherwise make good, any defect in workmanship or materials in the above described material item which may develop within a period one (1) year (unless otherwise specified) from the date of final acceptance by the OWNER of the above name Project.

COMPANY _____

COMPANY ADDRESS _____

BY _____

TITLE _____

SIGNED _____

DATE _____

END OF SECTION

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SECTION 01110

ENVIRONMENTAL PROTECTION PROCEDURES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this Section consists of furnishing all labor, materials and equipment and performing all work required for the prevention of environmental pollution in conformance with applicable laws and regulations during and as the result of construction operations under this Contract. For the purpose of this Specification, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances; adversely affect plants or animals; or degrade the utility of the environment for aesthetic and/or recreational purposes.
- B. The control of environmental pollution requires consideration of air, water and land and involves management of noise and solid waste as well as other pollutants. Refer to the Remediation Work Plan for additional requirements not presented in the Specifications.
- C. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. Provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, staked hay bales, seeding, mulching or other special surface treatments as are required to prevent silting, muddying, or pollution of wetlands, streams, rivers, impoundments, lakes, stormwater ponds, etc. All erosion control measures shall be in place in an area prior to any construction activity in that area and shall be maintained throughout construction. Specific requirements for erosion and sedimentation controls are specified in Section 02270. The CONTRACTOR will be required to meet all the conditions specified in the permits and in the Specifications.
- D. All specific conditions attached to existing permits for this site shall be included in the sedimentation and erosion control measures.

1.02 APPLICABLE REGULATIONS

- A. Comply with all applicable laws and regulations and applicable permits and their specific conditions concerning environmental pollution control and abatement.

1.03 NOTIFICATIONS

- A. The USAID COTR OR DESIGNATE will notify the CONTRACTOR in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. Agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the CONTRACTOR in writing, through the USAID COTR OR DESIGNATE, of any non-compliance with requirements. The CONTRACTOR shall, after receipt of such notice from the USAID COTR OR DESIGNATE or from the regulatory agency through the USAID COTR OR DESIGNATE, immediately take corrective action. Such notice, when delivered to the

CONTRACTOR or their authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the CONTRACTOR fails or refuses to comply promptly, the USAID COTR OR DESIGNATE may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the CONTRACTOR unless it is later determined that the CONTRACTOR was in compliance.

1.04 IMPLEMENTATION

- A. Prior to commencement of the work, meet with the USAID COTR OR DESIGNATE to develop mutual understandings relative to compliance with this provision and administration of the environmental pollution control program.
- B. Remove temporary environmental control features, when approved by the USAID COTR OR DESIGNATE, and incorporate permanent control features into the project at the earliest practicable time.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EROSION CONTROL

- A. Provide positive means of erosion control such as shallow run on and run off ditches around construction to carry off surface water. Erosion control measures, such as siltation basins, hay check dams, mulching, jute netting and other equivalent techniques, shall be used as appropriate. Flow of surface water into excavated areas shall be prevented. If dewatering is necessary, a dewatering plan must be prepared by a certified or registered Engineer and submitted to the USAID COTR OR DESIGNATE prior to the commencement of work requiring dewatering. CONTRACTOR must comply with all permits. No water from dewatering activities may be discharged offsite. At the completion of the work, ditches shall be backfilled and the ground surface restored to original condition.

3.02 PROTECTION OF STREAMS AND CANALS

- A. Care shall be taken to prevent, or reduce to a minimum, any damage to any ditch or stormwater outfall canal, from pollution by debris, sediment or other material, or from the manipulation of equipment and/or materials in or near such ditches. Water that has been used for washing or processing, or that contains oils or sediments that will reduce the quality of the water in the ditch, shall not be directly returned to the ditch. Such waters will be diverted through a settling basin or filter approved by the USAID COTR OR DESIGNATE and meet required standards before being directed into the ditches and other water bodies.
- B. The CONTRACTOR shall not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water or any storm sewer unless otherwise approved by the USAID COTR OR DESIGNATE. Water from

dewatering operations shall be treated by filtration, settling basins, or other approved method to reduce the amount of sediment contained in the water to allowable levels.

- C. All preventative measures shall be taken to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with a contingency action plan approved by the appropriate local environmental agencies. CONTRACTOR shall submit two copies of approved contingency plans to the USAID COTR OR DESIGNATE.

3.03 PROTECTION OF LAND RESOURCES

- A. Land resources within the project boundaries and outside the limits of permanent work shall be restored to a condition, after completion of construction that will appear to be natural and not detract from the appearance of the project. Confine all construction activities to areas shown on the Drawings.
- B. Outside of areas requiring earthwork for the construction of the new facilities, the CONTRACTOR shall not deface, injure, or destroy trees or shrubs, nor remove or cut them without prior approval from the USAID COTR OR DESIGNATE. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage unless specifically authorized by the USAID COTR OR DESIGNATE. Where such special emergency use is permitted, first wrap the trunk with a sufficient thickness of burlap or rags over which softwood cleats shall be tied before any rope, cable, or wire is placed. The CONTRACTOR shall in any event be responsible for any damage resulting from such use.
- C. Where trees may possibly be defaced, bruised, injured, or otherwise damaged by the CONTRACTOR's equipment, dumping or other operations, protect such trees by placing barricades around them. Monuments and markers shall be protected similarly before beginning operations near them.
- D. Any trees or other landscape feature scarred or damaged by the CONTRACTOR's equipment or operations shall be restored as nearly as possible to its original condition. The USAID COTR OR DESIGNATE will decide what method of restoration shall be used and whether damaged trees shall be treated and healed or removed and disposed of.

All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted.

Climbing ropes shall be used where necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the CONTRACTOR and are beyond saving in the opinion of the USAID COTR OR DESIGNATE, shall be immediately removed and replaced.

- E. The locations of the CONTRACTOR's storage, and other construction structures, required temporarily in the performance of the Work, shall be cleared as shown on the Drawings. Drawings showing storage facilities shall be submitted for approval of the USAID COTR OR DESIGNATE.

- F. If the CONTRACTOR proposes to construct temporary roads or embankments and excavations for work areas, they shall submit the following for approval at least 30 days prior to scheduled start of such temporary work.
1. A layout of all temporary roads, excavations and embankments to be constructed within the work area.
 2. Details of temporary road construction.
 3. Drawings and cross sections of proposed embankments and their foundations, including a description of proposed materials.
- G. Remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess of waste materials, or any other vestiges of construction as directed by the USAID COTR OR DESIGNATE. The disturbed areas shall be prepared and seeded as described in Section 02985, or as approved by the USAID COTR OR DESIGNATE.
- H. All debris and excess material will be disposed of in an approved area as noted on the Drawings.

3.04 PROTECTION OF AIR QUALITY

- A. Burning. No open fires or burning will be permitted. If need dictates burning of any kind, CONTRACTOR must obtain prior approval of USAID COTR OR DESIGNATE and obtain appropriate permits from the appropriate regulatory agency.
- B. Dust Control. The CONTRACTOR will be required to maintain all excavations, embankment, stockpiles, access roads, waste areas, borrow areas, and all other work areas within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded, and which would cause a hazard or nuisance to others.
- C. An approved method of stabilization consisting of sprinkling or other similar methods will be required to control dust. The use of petroleum products is prohibited.
- D. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the CONTRACTOR must have sufficient competent equipment on the job to accomplish this if sprinkling is used. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs, as determined by the USAID COTR OR DESIGNATE.

3.05 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

- A. During the life of this Contract, maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

3.06 NOISE CONTROL

- A. The CONTRACTOR shall make every effort to minimize noises caused by their operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with all regulations.

3.07 STORMWATER DISCHARGES FROM CONSTRUCTION SITE

- A. The CONTRACTOR shall comply with stormwater discharge regulations and Amendments to the Clean Water Act (33 U.S.C. 1251 et seq.) or equivalent Vietnamese regulations.
- B. Under these regulations, construction projects that disturb more than 2 hectares must have and comply with a stormwater pollution prevention plan. A plan shall be completed and signed by the CONTRACTOR prior to initiation of any construction activities on the site.
- C. The CONTRACTOR shall ensure that all employees and subcontractors implement the sediment and erosion control practices specified in Section 02270 and shown on the Drawings to properly manage stormwater.
- D. When all disturbed soils have been stabilized and temporary erosion and sediment control measures have been removed, this constitutes "elimination of stormwater discharges associated with industrial activities."

END OF SECTION

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SECTION 01152

APPLICATIONS FOR PAYMENT

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The CONTRACTOR shall submit Applications for Payment to the USAID COTR OR DESIGNATE in accordance with the schedule established by Conditions of the Contract and Agreement between USAID and CONTRACTOR.
- B. The accepted Schedule of Values, Section 01370, shall be used as the basis for the CONTRACTOR's Application for Payment.

1.02 RELATED REQUIREMENTS

- A. The Contract Documents include, but are not limited to, the following related sections:
 - 1. Agreement between USAID and CONTRACTOR.
 - 2. Schedule of Values is included in Section 01370.
 - 3. Construction Photographs are included in Section 01390.
 - 4. Contract Closeout is included in Section 01700.
 - 5. Project Record Documents are included in Section 01720.

1.03 SUBMITTALS

- A. Submit applications typed on forms provided by the USAID, Application for Payment, with itemized data typed on A4 white paper continuation sheets.
- B. Provide itemized data on continuation sheet:
 - 1. Format, schedules, line items and values: Those of the Schedule of Values accepted by the USAID COTR OR DESIGNATE.
- C. Provide construction photographs in accordance with Section 01390.

1.04 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

- A. Application Form:
 - 1. Fill in required information, including that for Change Orders executed prior to date of submittal of application.
 - 2. Fill in summary of dollar values to agree with respective totals indicated on continuation sheets.

3. Execute certification with signature of a responsible officer of Contract firm.
- B. Continuation Sheets:
1. Fill in total list of all scheduled component items of Work, with item number and scheduled dollar value for each item.
 2. Fill in dollar value in each column for each scheduled line item when work has been performed or products stored.
 - a. Round off values to nearest dollar, or as specified for Schedule of Values.
 3. List each Change Order executed prior to date of submission, at the end of the continuation sheets.
 - a. List by Change Order Number and description, as for an original component item of work.
 4. To receive approval for payment on component material stored on site, submit copies of the original paid invoices with the application for payment.

1.05 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

- A. When the USAID COTR OR DESIGNATE requires substantiating data, CONTRACTOR shall submit suitable information, with a cover letter identifying:
1. Project.
 2. Application number and date.
 3. Detailed list of enclosures.
 4. For stored products:
 - a. Item number and identification as shown on application.
 - b. Description of specific material.
- B. Submit one copy of data and cover letter for each copy of application.
- C. The CONTRACTOR is to maintain an updated set of drawings to be used as record drawings in accordance with Section 01720. As a prerequisite for monthly progress payments, the CONTRACTOR is to exhibit the updated record drawings for review by the USAID COTR OR DESIGNATE.

1.06 PREPARATION OF APPLICATION FOR FINAL PAYMENT

- A. Fill in Application form as specified for progress payments.

- B. Use continuation sheet for presenting the final statement of accounting as specified in Section 01700 – Contract Closeout.
- C. Unless required sooner by other Sections, submit all Project Record Documents in accordance with Sections 01050 and 01720, and as indicated elsewhere in the specifications.

1.07 SUBMITTAL PROCEDURE

- A. Submit Applications for Payment to the USAID COTR OR DESIGNATE at the times stipulated in the Agreement.
- B. Number: Three copies of each Application.
- C. When the USAID COTR OR DESIGNATE finds Application properly completed and correct, they will transmit certificate for payment to USAID, with copy to CONTRACTOR.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01153

CHANGE ORDER PROCEDURES

PART 1 GENERAL

1.01 REQUIREMENTS

- A. See Contract Section H.39 "Equitable Adjustments" for requirements related to Change Order Procedures.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01200

PROJECT MEETINGS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The USAID COTR OR DESIGNATE shall schedule and administer the kick-off meeting, pre-work conference, periodic progress meetings, and specially called meetings throughout progress of the Work. The USAID COTR OR DESIGNATE shall:
1. Prepare agenda for meetings.
 2. Make physical arrangements for meetings.
 3. Preside at meetings.
 4. Record the minutes; include significant proceedings and decisions.
 5. Reproduce and distribute copies of minutes within seven (7) working days after each meeting.
 - a. To participants in the meeting.
 - b. To parties affected by decisions made at the meeting.
- B. Representatives of CONTRACTOR, subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
- C. The CONTRACTOR shall attend meetings to ascertain that work is expedited consistent with Contract Documents and construction schedules.

1.02 RELATED REQUIREMENTS

- A. The Contract Documents include, but are not limited to, the following related sections:
1. Construction Services Agreement.
 2. Section 01300 – Submittals.
 3. Section 01310 – Construction Schedules
 4. Section 01700 – Contract Closeout.

1.03 KICK-OFF MEETING

- A. Schedule a kick-off meeting no later than seven (7) calendar days after issuance of the Notice to Proceed.

- B. The location shall be at a central site, convenient for all parties, designated by the USAID COTR OR DESIGNATE.
- C. Attendance:
 - 1. USAID COTR OR DESIGNATE.
 - 2. USAID CMC.
 - 3. CONTRACTOR's Project Manager and Superintendent.
 - 4. Major Subcontractors.
 - 5. Others as appropriate.
- D. Suggested Agenda:
 - 1. Distribution and discussion of project schedule.
 - 2. Site mobilization, including anticipated site personnel and equipment.
 - 3. Procurement of materials.
 - 4. Site access requirements.

1.04 PRE-WORK CONFERENCE

- A. Schedule a pre-work conference no later than twenty-eight (28) calendar days after issuance of the Notice to Proceed.
- B. The location shall be at a central site, convenient for all parties, designated by the USAID COTR OR DESIGNATE.
- C. Attendance:
 - 1. USAID COTR OR DESIGNATE.
 - 2. USAID CMC.
 - 3. CONTRACTOR's Project Manager and Superintendent.
 - 4. Major Subcontractors.
 - 5. Others as appropriate.
- D. Suggested Agenda:
 - 1. Distribution and discussion of:
 - a. List of major subcontractors and suppliers.

- b. Projected Construction Schedules.
2. Critical work sequencing.
3. Major equipment deliveries and priorities.
4. Project Coordination.
 - a. Designation of responsible personnel.
5. Procedures and processing of:
 - a. Field decisions.
 - b. Proposal requests.
 - c. Submittals.
 - d. Change Orders.
 - e. Applications for Payment.
6. Adequacy of distribution of Contract Documents.
7. Procedures for maintaining Record Documents.
8. Use of premises:
 - a. Site access.
 - b. Office, work and storage areas.
 - c. Airport requirements.
9. Construction facilities, controls and construction aids.
10. Health and safety.
11. Temporary utilities.
12. Housekeeping procedures.

1.05 PROGRESS MEETINGS

- A. Schedule regular periodic meetings. The progress meetings will be held weekly.
- B. Hold called meetings as required by progress of the Work.
- C. Location of the meetings: Project field office of USAID COTR OR DESIGNATE or other location designated by the USAID COTR OR DESIGNATE.

D. Attendance:

1. USAID COTR OR DESIGNATE, as needed.
2. USAID CMC.
3. CONTRACTOR's Project Manager and Superintendent.
4. Subcontractors as appropriate to the agenda.
5. Suppliers as appropriate to the agenda.
6. Others as appropriate.

E. Suggested Agenda:

1. Comments, corrections, or additions to the notes of the previous meeting
2. Review of work performed since last meeting
 - a. Construction
 - b. Deliveries
 - c. Subcontractors on site
 - d. Work force/schedule
 - e. USAID COTR OR DESIGNATE's comments
 - f. USAID CMC's comments
3. Contractor's forecast or work projected
 - a. Construction
 - b. Major deliveries
 - c. Subcontractors scheduled on site
 - d. Work force/schedule
4. Review of contractor's construction schedule
 - a. Milestones
 - b. Problems which may impact schedule
 - c. Corrective measures
 - d. Critical and long-lead items

5. Submittals
 6. Issues, concerns, and action items
 - a. Design issues
 - b. Permitting issues
 - c. Potential change orders
 - d. Action items
 - e. Other issues
 7. Applications for payment and construction photos
 8. Other business
 - a. Next meeting
- F. The CONTRACTOR is to attend progress meetings and is to study previous meeting minutes and current agenda items, in order to be prepared to discuss pertinent topics such as deliveries of materials and equipment, progress of the Work over past 7 days, and work forecast for next four weeks.
- G. The CONTRACTOR is to provide a current submittal log at each progress meeting in accordance with Section 01300, and an updated construction schedule in accordance with Section 01310.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section specifies the general methods and requirements of submissions applicable to the following work related submittals: Shop Drawings, Product Data, and Samples. Detailed submittal requirements are specified in the technical specifications sections.
- B. All submittals shall be clearly identified by reference to Specification Section, Paragraph, Drawing Number or Detail as applicable. Submittals shall be clear and legible and of sufficient size for sufficient presentation of data.

1.02 SCHEDULE OF SUBMITTALS

- A. CONTRACTOR to prepare a complete schedule of submittals.
 - 1. Coordinate Schedule of Submittals with the list of subcontractors, schedule of values, product listing, as well as the Contract construction schedule.
 - 2. Prepare the schedule in chronological order. Provide the following information for each submittal:
 - a. Submittal category and name.
 - b. Name of Contractor, if applicable.
 - c. Brief description of the part of the Work covered.
 - d. Related Section number.
 - e. Scheduled date for delivery of submittal to USAID COTR OR DESIGNATE
 - f. Scheduled date for the USAID COTR OR DESIGNATE's final review of submittal.
 - 3. Prepare the Schedule of Submittals with columns for recording actual dates of submittal processing.
- B. Distribution: Following response to initial submittal, print and distribute copies to the USAID COTR OR DESIGNATE, subcontractors, suppliers and other parties who are required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.
 - 1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their

assigned portion of the Work and are no longer involved in construction activities.

- C. Updating Schedule of Submittals: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.03 SHOP DRAWINGS, PRODUCT DATA, SAMPLES

A. Shop Drawings

- 1. Shop Drawings, as defined in the General Conditions, and as specified in individual work Sections include, but are not necessarily limited to, custom-prepared data such as fabrication and erection/installation (working) drawings, scheduled information, setting diagrams, actual shopwork manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications, as applicable to the Work.

Standard Product information prepared without specific reference to Project requirements will not be considered a shop drawing.

- 2. All shop drawings submitted by subcontractors for approval shall be sent directly to the CONTRACTOR for checking. The CONTRACTOR shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.
- 3. The CONTRACTOR shall check all Subcontractor's shop drawings regarding measurements, size of members, materials, and details to satisfy himself that they conform to the intent of the Drawings and Specifications. Shop drawings found to be inaccurate or otherwise in error shall be returned to the subcontractors for correction before submission thereof.
- 4. All details on shop drawings submitted for approval shall show clearly the relation of the various parts to the main members and lines of the structure, and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted for approval.
- 5. Facsimiles or copies of facsimiles will not be accepted for review.

B. Product Data

- 1. Product data as specified in individual Sections, include, but are not necessarily limited to, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the Manufacturer's product specification and installation instructions, availability of colors and patterns, manufacturer's printed statements of compliances and applicability, roughing-in diagrams and templates,

catalog cuts, product photographs, standard wiring diagrams, printed performance curves and operational-range diagrams, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare-parts listing and printed product warranties, as applicable to the Work.

2. Facsimiles or copies of facsimiles will not be accepted for review.

C. Working Drawings

1. When used in the Contract Documents, the term "working drawings" shall be considered to mean the CONTRACTOR's plans for temporary structures such as temporary bulkheads, support of open cut excavation, support of utilities, ground water control systems, forming and falsework; and for such other work as may be required for construction but does not become an integral part of the Project.
2. Working drawings shall be prepared and sealed by a registered or licensed engineer. The CONTRACTOR shall submit a letter of certification from the licensed or professional engineer stating that he/she has prepared the designs and has verified that the materials/ equipment have been installed as designed. No working drawings or calculations/computations relating to the working drawings shall be submitted to the USAID COTR OR DESIGNATE unless specifically requested in writing.

D. Samples

1. Samples specified in individual Sections, include, but are not necessarily limited to, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols and units of work to be used by the USAID COTR OR DESIGNATE for independent inspection and testing, as applicable to the Work.

1.04 CONTRACTOR'S RESPONSIBILITIES

- A. The CONTRACTOR shall review shop drawings, product data and samples, including those by subcontractors, prior to submission to determine and verify the following:
 1. Field measurements
 2. Field construction criteria
 3. Catalog numbers and similar data
 4. Conformance with the Specifications
- B. Each shop drawing, sample and product data submitted by the CONTRACTOR shall have affixed to it the following Certification Statement including the CONTRACTOR's

Company name and signed by the CONTRACTOR: "Certification Statement: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements." Shop drawings and product data sheets size A3 and smaller shall be bound together in an orderly fashion and bear the above Certification Statement on the cover sheet. The cover sheet shall fully describe the packaged data and include a listing of all items within the package.

Provide to the USAID COTR OR DESIGNATE a copy of each submittal transmittal sheet for shop drawings, product data, and samples at the time of submittal of said drawings, product data and samples.

- C. The CONTRACTOR shall utilize a 10-character submittal identification numbering system in the following manner:
1. The first character shall be a D, S, P, M, or R, which represents Shop/Working Drawing and other Product Data (D), Sample (S), Preliminary Submittal (P), Operating/Maintenance Manual (M), or Request for Information (R).
 2. The next five digits shall be the applicable Specification Section Number.
 3. The next three digits shall be the numbers 001-999 to sequentially number each initial separate item or drawing submitted under each specific Section number.
 4. The last character shall be a letter, A-Z, indicating the submission, or resubmission of the same Drawing, i.e., "A=1st submission, B=2nd submission, C=3rd submission, etc.

A typical submittal number would be as follows:

D-03300-008-B

D = Shop Drawing

03300 = Specification Section for Concrete

008 = The eighth initial submittal under this specification section

B = The second submission (first resubmission) of that particular shop drawing

- D. Notify the USAID COTR OR DESIGNATE in separate written correspondence, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.

Deviations from the requirements of the Contract Documents included in a submittal reviewed by the USAID COTR OR DESIGNATE are not accepted unless

they have been identified by the CONTRACTOR in writing and specifically acknowledged as having been reviewed by the USAID COTR OR DESIGNATE.

- E. The review and approval of shop drawings, samples or product data by the USAID COTR OR DESIGNATE shall not relieve the CONTRACTOR from his/her responsibility with regard to the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the CONTRACTOR and the USAID COTR OR DESIGNATE will have no responsibility therefor.
- F. No portion of the work requiring a shop drawing, sample, or product data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to approved shop drawings and data shall be at the CONTRACTOR's risk. USAID and the USAID COTR OR DESIGNATE will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.
- G. Project work, materials, fabrication, and installation shall conform with approved shop drawings, applicable samples, and product data.

1.05 SUBMISSION REQUIREMENTS

- A. Make submittals promptly in accordance with approved schedule, and Schedule of Submittals and in such sequence as to cause no delay in the Work or in the work of any other CONTRACTOR.
- B. The CONTRACTOR shall submit to the USAID COTR OR DESIGNATE all shop drawings and data sufficiently in advance of construction requirements to provide no less than fourteen (14) calendar days for review from the time the USAID COTR OR DESIGNATE receives them. No less than thirty (30) calendar days will be required for major equipment that required review by more than one (1) Engineering discipline. Each re-submission of a shop drawing will establish a new 14 or 30 calendar day review period.
- C. Number of submittals required:
 - 1. Shop Drawings as defined in Paragraph 1.03 A: Six (6) copies.
 - 2. Product Data as defined in Paragraph 1.03 B: Six (6) copies.
 - 3. Samples: Submit the number stated in the respective Specification Sections.
- D. Submittals shall contain:
 - 1. The date of submission and the dates of any previous submissions.
 - 2. The Project title and number.
 - 3. CONTRACTOR identification.

4. The names of:
 - a. Contractor
 - b. Supplier
 - c. Manufacturer
5. Identification of the product, with the specification section number, page and paragraph(s).
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the Work or materials.
8. Applicable standards, such as ASTM or Federal Specification numbers.
9. Identification of deviations from Contract Documents.
10. Identification of revisions on resubmittals.
11. A 20 cm x 7 cm blank space for CONTRACTOR and USAID COTR OR DESIGNATE stamps.

1.06 REVIEW OF SHOP DRAWINGS, PRODUCT DATA, WORKING DRAWINGS AND SAMPLES

- A. The review of shop drawings, data, and samples will be for general conformance with the design concept and Contract Documents. They shall not be construed:
 1. As permitting any departure from the Contract requirements;
 2. As relieving the CONTRACTOR of responsibility for any errors, including details, dimensions, and materials;
 3. As approving departures from details furnished by the USAID COTR OR DESIGNATE, except as otherwise provided herein.
- B. The CONTRACTOR remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.
- C. If the shop drawings, data or samples as submitted describe variations and show a departure from the Contract requirements which USAID COTR OR DESIGNATE finds to be in the interest of USAID and to be so minor as not to involve a change in Contract Price or time for performance, the USAID COTR OR DESIGNATE may return the reviewed drawings without noting an exception.
- D. Submittals will be returned to the CONTRACTOR under one of the following codes.

Code 1 - "APPROVED" is assigned when there are no notations or comments on the submittal. When returned under this code the CONTRACTOR may release the equipment and/or material for manufacture.

Code 2 - "APPROVED AS NOTED". This code is assigned when a confirmation of the notations and comments IS NOT required by the CONTRACTOR. The CONTRACTOR may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.

Code 3 - "APPROVED AS NOTED/CONFIRM". This combination of codes is assigned when a confirmation of the notations and comments is required by the CONTRACTOR. The CONTRACTOR may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. This confirmation shall specifically address each omission and nonconforming item that was noted.

Confirmation is to be received by the USAID COTR OR DESIGNATE within 10 calendar days of the date of the USAID COTR OR DESIGNATE's transmittal requiring the confirmation.

Code 4 - "APPROVED AS NOTED/RESUBMIT". This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the package. The CONTRACTOR may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. This resubmittal is to address all comments, omissions and non-conforming items that were noted.

Resubmittal is to be received by the USAID COTR OR DESIGNATE within 10 calendar days of the date of the USAID COTR OR DESIGNATE's transmittal requiring the resubmittal.

Code 5 - "NOT APPROVED" is assigned when the submittal does not meet the intent of the Contract Documents. The CONTRACTOR must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different Manufacturer/vendor to meet the Contract Documents.

Code 6 - "COMMENTS ATTACHED" is assigned where there are comments attached to the returned submittal which provide additional data to aid the CONTRACTOR.

Code 7 - "RECEIPT ACKNOWLEDGED" is assigned to acknowledge receipt of a submittal that is not subject to the USAID COTR OR DESIGNATE's review of approval, and is being filed for informational purposes only. This code is generally used in acknowledging receipt of means and methods of construction work plans, field conformance test reports, and health and safety plans.

Codes 1 through 5 designate the status of the reviewed submittal with Code 6 showing there has been an attachment of additional data. Code 7 is used as may be necessary.

- E. Resubmittals will be handled in the same manner as first submittals. On resubmittals the CONTRACTOR shall direct specific attention, in writing on the letter of transmittal and on resubmitted shop drawings by use of revision triangles or other similar methods, to revisions other than the corrections requested by the USAID COTR OR DESIGNATE, on previous submissions. Any such revisions which are not clearly identified shall be made at the risk of the CONTRACTOR. The CONTRACTOR shall make corrections to any work done because of this type revision that is not in accordance to the Contract Documents as may be required by the USAID COTR OR DESIGNATE.
- F. Partial submittals may not be reviewed. The USAID COTR OR DESIGNATE will be the only judge as to the completeness of a submittal. Submittals not complete will be returned to the CONTRACTOR, and will be considered "Not Approved" until resubmitted. The USAID COTR OR DESIGNATE may at their option provide a list or mark the submittal directing the CONTRACTOR to the areas that are incomplete.
- G. Repetitive Review
 - 1. Shop drawings and other submittals will be reviewed no more than twice at USAID's expense. All subsequent reviews will be performed at times convenient to the USAID COTR OR DESIGNATE and at the CONTRACTOR's expense, based upon a flat rate of \$120.00 per hour. The CONTRACTOR shall reimburse USAID for all such fees invoiced to USAID by the USAID COTR OR DESIGNATE. Submittals are required until approved.
 - 2. Any need for more than one resubmission, or any other delay in obtaining USAID COTR OR DESIGNATE's review of submittals, will not entitle CONTRACTOR to extension of the Contract Time.
- H. If the CONTRACTOR considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the CONTRACTOR shall give written notice thereof to the USAID COTR OR DESIGNATE at least seven working days prior to release for manufacture.
- I. When the shop drawings have been completed to the satisfaction of the USAID COTR OR DESIGNATE, the CONTRACTOR shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the USAID COTR OR DESIGNATE.
- J. Request for Information (RFI) shall be submitted on a standard form provided by the USAID COTR OR DESIGNATE. RFIs shall indicate their importance to the timely completion of the project. RFIs will be processed as a shop drawing unless there is an urgent need for immediate response.

1.07 DISTRIBUTION

- A. Number of approved shop drawing copies distributed to the CONTRACTOR by the USAID COTR OR DESIGNATE shall not exceed 4.

1.08 GENERAL PROCEDURES FOR SUBMITTALS

- A. Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in advance of performing the related work or other applicable activities, or within the time specified in the individual work sections, of the Specifications, so that the installation will not be delayed by processing times including disapproval and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery and similar sequenced activities. No extension of time will be authorized because of the CONTRACTOR's failure to transmit submittals sufficiently in advance of the Work.

END OF SECTION

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SECTION 01310

CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.01 GENERAL

- A. Construction under this Contract must be coordinated to assure that construction is completed within the time allowed by the Contract Documents. The CONTRACTOR shall also coordinate his activities with the other contractors to allow orderly and timely completion of all the work.
- B. When access through interface and/or overlapping construction areas must be disrupted, the CONTRACTOR shall provide alternate acceptable access for other contractors.
- C. The CONTRACTOR is required to coordinate his activities in the interface or common areas with these other contractors and Airport operations. The CONTRACTOR must submit to the USAID COTR OR DESIGNATE a description and schedule as to how the common areas will be utilized, recognizing the required coordination with other contractors, Airport operations, and the USAID COTR OR DESIGNATE.

1.02 CONSTRUCTION SCHEDULING GENERAL PROVISIONS

- A. No work shall be done between 7:00 P.M. and 7:00 A.M., or on Sundays or legal holidays without the written permission of the USAID COTR OR DESIGNATE. However, emergency work may be done without prior permission.
- B. CONTRACTOR shall provide electronic file of CPM schedule updated on bi-weekly basis. The program disk/file, the diagrams and reports shall be prepared by using Primavera Contractor 6.1, or latest version.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01370

SCHEDULE OF VALUES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The CONTRACTOR shall submit to the USAID COTR OR DESIGNATE a Schedule of Values allocated to the various portions of the Work, within 10 calendar days after the effective date of the Agreement.
- B. Upon request of the USAID COTR OR DESIGNATE, support the values with data which will substantiate their correctness.
- C. The accepted Schedule of Values shall be used only as the basis for the CONTRACTOR's Applications for Payment.

1.02 RELATED REQUIREMENTS

- A. The Contract Documents include, but are not limited to, the following related sections:
 - 1. Construction Services Agreement.
 - 2. Section 01025 – Measurement and Payment
 - 3. Section 01152 – Applications for Payment.

1.03 FORM AND CONTENT OF SCHEDULE OF VALUES

- A. Format schedule on A4 white paper using the Schedule of Cost for Major Structures and/or Areas of Work. Identify schedule with:
 - 1. Title of Project and location.
 - 2. USAID's Project number.
 - 3. Name and Address of CONTRACTOR.
 - 4. Contract designation.
 - 5. Date of submission.
- B. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction. At a minimum, the component parts listed on the Bid Form shall be used.
- C. Identify each line item with the number and title of the respective major section of the specifications.

- D. For each major line item list sub-values of major products or operations under the item.
- E. For the various portions of the Work:
 - 1. Each item shall include a directly proportional amount of the CONTRACTOR's overhead and profit.
 - 2. For items on which progress payments will be requested for stored materials, break down the value into:
 - a. The cost of the materials, delivered and unloaded, with taxes paid. Paid invoices are required for materials upon request by the ENGINEER.
 - b. The total installed value.
- F. The sum of all values listed in the schedule shall equal the total Contract Sum.

1.04 SUBSCHEDULE OF UNIT MATERIAL VALUES

- A. Submit a sub-schedule of unit costs and quantities for:
 - 1. Products on which progress payments will be requested for stored products.
- B. The form of submittal shall parallel that of the Schedule of Values, with each item identified the same as the line item in the Schedule of Values.
- C. The unit quantity for bulk materials shall include an allowance for normal waste.
- D. The unit values for the materials shall be broken down into:
 - 1. Cost of the material, delivered and unloaded at the site, with taxes paid.
 - 2. Copies of invoices for component material shall be included with the payment request in which the material first appears.
 - 3. Paid invoices shall be provided with the second payment request in which the material appears or no payment shall be allowed and/or may be deleted from the request.
- E. The installed unit value multiplied by the quantity listed shall equal the cost of that item in the Schedule of Values.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01390

CONSTRUCTION PHOTOGRAPHS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. CONTRACTOR shall provide a competent photographer to take construction record photographs periodically during course of the Work.

1.02 PHOTOGRAPHY REQUIRED

- A. Prior to the start of construction, CONTRACTOR to take still photographs of the entire construction site adequately documenting preconstruction conditions.
- B. Take a minimum of two color aerial photographs before construction starts, one photo after Phase I installation of the insulated floor, one photo of the insulated floor prior to beginning the Phase II backfilling, two photos of the exterior concrete block embankment after the first vertical lift (one during each Phase), two photos of the insulation and steel panels after backfilling has begun (one during each Phase), and two photos after placement of the thermal treatment cap (one during each Phase) with distribution as specified by paragraph 3.04.
- C. For the project site area construction, provide ground photographs with at least six (6) different views each month, taken at each stage of construction, for each scheduled Application for Payment.
- D. Digital Photograph Files:
 - 1. The photographer shall maintain digital photograph files for a period of the entire project and then shall convey the files to the USAID COTR OR DESIGNATE upon substantial completion of project.
 - 2. Photographer shall agree to furnish additional prints to USAID and the USAID COTR OR DESIGNATE at commercial rates applicable at time of purchase. Photographer shall also agree to participate as required in any litigation requiring the photographer as an expert witness.

1.03 COSTS OF PHOTOGRAPHY

- A. The CONTRACTOR shall pay costs for specified photography and prints.
 - 1. Parties requiring additional photography or prints will pay photographer directly.

PART 2 PRODUCTS

2.01 PRINTS

- A. Color:
 - 1. Paper: Single weight, color print paper.
 - 2. Finish: Smooth surface glossy.
 - 3. Size: 20-cm x 25-cm.
- B. Identify each print on back, listing:
 - 1. Name of Project
 - 2. Orientation of View
 - 3. Date and time of exposure
 - 4. Name and address of photographer
 - 5. Photographer's numbered identification of exposure
- C. Aerial photographs to be color 20-cm x 25-cm.

PART 3 EXECUTION

3.01 TECHNIQUE

- A. Factual presentation
- B. Correct exposure and focus
 - 1. High resolution and sharpness
 - 2. Maximum depth-of-field
 - 3. Minimum distortion

3.02 VIEWS REQUIRED

- A. Photograph from location to adequately illustrate condition of construction and state of progress.
 - 1. At successive periods of photography, take at least one photograph from the same overall view as previously.
 - 2. Consult with the USAID COTR OR DESIGNATE at each period of photography for instructions concerning views required.

3.03 ASSEMBLY OF PRINTS

- A. Binders shall be provided in sufficient quantity to hold all photographs taken for the duration of the contract. Each binder shall be labeled by engraving on the front and spine with the USAID's name, project name, and binder volume number.
- B. Each print shall be inserted in a separate, archival type, non-glare, and three-hole punched photo protector.
- C. Provide an updated Table of Contents for the binder(s) and a tabbed divider with each set of prints.

3.04 DELIVERY OF PRINTS

- A. Deliver prints to the USAID COTR OR DESIGNATE to accompany each Application for Payment.
- B. Distribution of prints as soon as processed is anticipated to be as follows:
 - 1. USAID COTR OR DESIGNATE (two sets)
 - 2. USAID (one set)
- C. No construction shall start until preconstruction photographs are completed and submitted to the USAID COTR OR DESIGNATE.

END OF SECTION

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SECTION 01410

TESTING AND TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The USAID COTR OR DESIGNATE will be responsible for confirmation and environmental sampling as identified in the Site-Wide Sampling and Analysis Plan.
 - 1. CONTRACTOR shall cooperate with the USAID COTR OR DESIGNATE to facilitate the execution of the required testing.
- B. CONTRACTOR shall employ and pay for the services of an independent Quality Assurance Laboratory (QAL) to perform geosynthetic material, geotechnical, concrete, and any other additional testing specifically indicated in the Contract Documents.
- C. For the testing performed by the CONTRACTOR:
 - 1. The testing laboratory(ies) hired shall certify the results.
 - 2. The CONTRACTOR shall cooperate with the laboratory(ies) to facilitate the execution of its required services.
 - 3. All testing laboratories shall be approved by the USAID COTR OR DESIGNATE.
 - 4. Employment of the laboratory(ies) shall in no way relieve CONTRACTOR's obligations to perform the work of the Contract.

1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.
- B. Respective sections of specifications: Certification of products.
- C. Each specification section listed: Laboratory tests required and standards for testing.
- D. Site-Wide Sampling and Analysis Plan
- E. Testing Laboratory inspection, sampling and testing is required for but not limited to the following:
 - 1. Dewatering and Drainage is included in Section 02140.
 - 2. Earthwork is included in Section 02200.
 - 3. Geotextile Fabric is included in Section 02273.

4. HDPE Liner is included in Section 02776.
5. Concrete Reinforcement is included in Section 03200.
6. Concrete is included in Section 03300.
7. Lightweight Insulating Concrete is included in Section 03521.
8. IPTD Thermal Insulation is included in Section 07210.

1.03 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

- A. Laboratory is not authorized to:
 1. Release, revoke, alter or enlarge on requirements of Contract Documents.
 2. Approve or accept any portion of the Work.
 3. Perform any duties of the Contractor.

1.04 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with laboratory personnel; provide access to work and manufacturer's operations.
- B. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.
- C. Provide to the laboratory the preliminary design mix proposed to be used for concrete and other materials mixes which require control by the testing laboratory.
- D. Materials and equipment used in the performance of work under this Contract are subject to inspection and testing at the point of manufacture or fabrication. Standard specifications for quality and workmanship are indicated in the Contract Documents. The USAID COTR OR DESIGNATE may require the CONTRACTOR to provide statements or certificates from the manufacturers and fabricators that the materials and equipment provided by them are manufactured or fabricated in full accordance with the standard specifications for quality and workmanship indicated in the Contract Documents. All costs of this testing and providing statements and certificates shall be a subsidiary obligation of the CONTRACTOR, and no extra charge USAID shall be allowed on account of such testing and certification.
- E. Furnish incidental labor and facilities:
 1. To provide access to work to be tested.
 2. To obtain and handle samples at the project site or at the source of the product to be tested.
 3. To facilitate inspections and tests.

- 4. For storage and curing of test samples.
- F. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.
- G. If the tests and any subsequent retests indicate the materials and equipment fail to meet the requirements of the Contract Documents, the CONTRACTOR will continue to pay for the laboratory costs directly to the testing firm.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01500

TEMPORARY FACILITIES AND UTILITIES

PART 1 GENERAL

1.01 TEMPORARY OFFICES

- A. Temporary offices shall be established on the job site where approved or directed by the USAID COTR OR DESIGNATE, adequately furnished, and maintained in a clean, orderly condition by the CONTRACTOR. The CONTRACTOR or their authorized representative shall be present in the field office at all times while work is in progress. Instructions received there from the USAID COTR OR DESIGNATE shall be considered as delivered to the CONTRACTOR.
- B. The temporary office shall be weather-tight, have a tight floor at least 20 cm off the ground and shall be insulated all around with rigid insulation board not less than 2 cm thick, and suitably ventilated. The office shall have at least three screened windows capable of being opened, and a solid door provided with cylinder lock and three keys. Provide a partitioned section of at least 10 square meters for use by the USAID COTR OR DESIGNATE's field representative. Furnish the USAID COTR OR DESIGNATE's field representative office with the following:
1. Desk about 1 m x 1.5 m with desk chair.
 2. One plan table approximately 1 m x 1.5 m with one stool.
 3. Two additional chairs.
 4. Four drawer file cabinet.
 5. Copy machine with scanning capabilities

It is assumed that the CONTRACTOR's trailer can be used for large meetings.

The office shall be provided with janitor service, air conditioning/heating equipment, electrical wiring, outlets, and fixtures suitable to light the tables and desk adequately as directed. Separate toilet facilities shall be provided for the use of the CONTRACTOR and their employees or subconsultants.

- C. The CONTRACTOR shall supply all fuel for heating and pay all electrical bills.

1.02 TEMPORARY TELEPHONE AND HIGH SPEED INTERNET

- A. High speed internet shall be provided through a land line or with an air card. CONTRACTOR must pay all project related bills charged against the telephone and internet service, including installation charge and all monthly charges throughout the construction period.

- B. Provide in conjunction a high-speed internet connection or air card for USAID COTR OR DESIGNATE's use.

1.03 TEMPORARY POWER AND LIGHT

- A. Furnish temporary light and power, complete with wiring, lamps, and similar equipment as required to adequately light all work areas and with sufficient power capacity to meet the reasonable needs of all subcontractors. Make all necessary arrangements with the local electric company for temporary electric service, and pay all expenses in connection therewith.
- B. Provide connections to existing facilities, sized to provide service required for power and lighting. (CONTRACTOR shall pay the cost of power used.)
- C. Install circuit and branch wiring, with area distribution boxes located so that power and lighting is available throughout the Site by use of construction type power cords.
- D. Provide properly configured NEMA polarized outlets to prevent insertion of 110 – 120 volt plugs into higher voltage outlets. For connection of power tools and equipment, provide outlets equipped with ground-fault circuit interrupters, reset button and pilot light.
- E. Provide grounded extension cords. Use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if more than one length is required.
- F. Provide general service incandescent lamps as required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures, where exposed to moisture.

1.04 TEMPORARY AIR, STEAM AND WATER

- A. The CONTRACTOR shall provide all air, steam and water, including temporary piping and appurtenances required therefore, as may be required for the cleaning and testing of pipelines and equipment necessary for their and their subcontractor's work. Temporary piping and appurtenances shall be removed upon approval of equipment being tested.

1.05 TEMPORARY SANITARY FACILITIES

- A. Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed in a fiberglass or other approved non-absorbent shell.

1.06 FIRE EXTINGUISHERS

- A. Provide portable fire extinguishers for temporary offices and similar spaces. In other locations, provide portable dry chemical extinguishers. Comply with NFPA 10 and 241,

or applicable local regulations, for classification, extinguishing agent and size required by location and class of fire exposure.

1.07 TEMPORARY UTILITIES REQUIREMENTS INCLUDED

- A. CONTRACTOR shall furnish, install and maintain temporary utilities required for construction, and remove on completion of Work.

1.08 TEMPORARY UTILITIES REQUIREMENTS OF REGULATORY AGENCIES

- A. Comply with National Electric Code, or Vietnamese equivalent.
- B. Comply with Vietnamese and local codes and regulations and with utility company requirements.
- C. Comply with Vietnamese and local health department regulations.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

- A. Materials may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

2.02 TEMPORARY ELECTRICITY AND LIGHTING

- A. Arrange with utility company and USAID COTR OR DESIGNATE to provide service required for power and lighting, and pay all costs for service and for power used in the construction, testing and trial operation prior to substantial completion of the work.
- B. Provide adequate artificial lighting for all areas of work when natural light is not adequate for work, and for areas accessible to the public.

2.03 TEMPORARY VENTILATION

- A. Provide temporary ventilation as required to maintain adequate environmental conditions to facilitate progress of the Work.
- B. Portable heaters shall be standard approved units complete with controls.
- C. Pay all costs of installation, maintenance, operation and removal, and for fuel consumed.
- D. Provide connections to existing facilities. Extend and supplement with temporary units as necessary to comply with requirements. Pay all costs of installation, maintenance, operation and removal.

2.04 TEMPORARY WATER

- A. Provide and pay for all required water for non-construction and consumptive purposes for the project.
- B. Potable water for construction purposes shall be coordinated through the USAID COTR OR DESIGNATE.

2.05 TEMPORARY SANITARY FACILITIES

- A. Provide sanitary facilities in compliance with laws and regulations.
- B. Service, clean and maintain facilities and enclosures.

PART 3 EXECUTION

3.01 GENERAL

- A. Maintain and operate systems to assure continuous service.
- B. Modify and extend systems as work progress requires.

3.02 REMOVAL

- A. Completely remove temporary materials and equipment when their use is no longer required as determined by the USAID COTR OR DESIGNATE.
- B. Clean and repair damage caused by temporary installations or use of temporary facilities.

END OF SECTION

SECTION 01610

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Material and equipment incorporated into the Work:
1. Conform to applicable specifications and standards.
 2. Comply with size, make, type, and quality specified, or as specifically approved in writing by the USAID COTR OR DESIGNATE.
 3. Manufactured and Fabricated Products
 - a. Design, fabricate, and assemble in accord with the best engineering and shop practices.
 - b. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.
 - c. Two or more items of the same kind shall be identical, by the same MANUFACTURER.
 - d. Products shall be suitable for service conditions.
 - e. Equipment capacities, sizes, and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
 4. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

1.02 RELATED REQUIREMENTS

- A. The Contract Documents include, but are not limited to, the following related sections:
1. Conditions of the Contract.
 2. Summary of Work is included in Section 01010.
 3. Special Project Procedures are included in Section 01100.
 4. Submittals are included in Section 01300.
 5. Cleaning is included in Section 01710.

1.03 APPROVAL OF MATERIALS

- A. Only new materials shall be incorporated in the work. All materials furnished by the CONTRACTOR shall be subject to the inspection and approval of the USAID COTR OR DESIGNATE. No material shall be delivered to the work site without prior approval of the USAID COTR OR DESIGNATE.
- B. Within 30 days after the effective date of the Agreement, the CONTRACTOR shall submit to the USAID COTR OR DESIGNATE, data relating to materials they propose to furnish for the work. Such data shall be in sufficient detail to enable the USAID COTR OR DESIGNATE to identify the particular product and to form an opinion as to its conformity to the specifications. The data shall comply with Section 01300.
- C. Facilities and labor for handling and inspection of all materials shall be furnished by the CONTRACTOR. If the USAID COTR OR DESIGNATE requires, either prior to beginning or during the progress of the work, the CONTRACTOR shall submit samples of materials for such special tests as may be necessary to demonstrate that they conform to the specifications. Such samples shall be furnished, stored, packed, and shipped as directed at the CONTRACTOR's expense. Except as otherwise noted, the CONTRACTOR will make arrangements for and pay for the tests.
- D. The CONTRACTOR shall submit data and samples sufficiently early to permit consideration and approval before materials are necessary for incorporation in the work. Any delay of approval resulting from the CONTRACTOR's failure to submit samples or data promptly shall not be used as a basis of claim against USAID or the USAID COTR OR DESIGNATE.
- E. In order to demonstrate the proficiency of workmen or to facilitate the choice among several textures, types, finishes and surfaces, the CONTRACTOR shall provide such samples of workmanship or finish as may be required.
- F. The materials used on the work shall correspond to the approved samples or other data.

1.04 MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION

- A. When Contract Documents require that installation of work shall comply with MANUFACTURER's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including three copies to the USAID COTR OR DESIGNATE.
- B. Handle, install, connect, clean, condition, and adjust products in strict accord with such instructions and in conformity with specified requirements.
 - 1. Should job conditions or specified requirements conflict with MANUFACTURER's instructions, consult with USAID COTR OR DESIGNATE for further instructions.
 - 2. Do not proceed with work without clear instructions.

- C. Perform work in accordance with MANUFACTURER's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.05 TRANSPORTATION AND HANDLING

- A. Arrange deliveries of Products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site.
 - 1. Deliver Products in undamaged condition, in MANUFACTURER's original containers or packaging, with identifying labels intact and legible.
 - 2. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that Products are properly protected and undamaged.
- B. Provide equipment and personnel to handle Products by methods to prevent soiling or damage to Products or packaging.

1.06 STORAGE AND PROTECTION

- A. The CONTRACTOR shall furnish a covered, weather-protected storage structure providing a clean, dry, noncorrosive environment for all special equipment to be incorporated into this project. The CONTRACTOR shall furnish a copy of the MANUFACTURER's instructions for storage to the USAID COTR OR DESIGNATE prior to storage of all equipment and materials. Materials not properly stored will not be included in a payment estimate.
- B. Store products in accordance with MANUFACTURER's instructions, with seals and labels intact and legible.
 - 1. Store products subject to damage by the elements in weather-tight enclosures.
 - 2. Maintain temperature and humidity within the ranges required by MANUFACTURER's instructions.
 - 3. Store fabricated products above the ground, on blocking or skids, to prevent soiling or staining. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.
 - 4. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
- C. All materials to be incorporated in the work shall be handled and stored by the CONTRACTOR before, during, and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting and any injury, theft or damage of any kind whatsoever to the material.

- D. Cement, sand, and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural and miscellaneous steel and reinforcing steel shall be stored off the ground or otherwise to prevent accumulations of dirt or grease and in a position to prevent accumulations of standing water and to minimize rusting. Precast concrete, brick, block, and similar masonry products shall be handled and stored in a manner to reduce breakage, chipping, cracking, and spalling to a minimum.
- E. All materials which, in the opinion of the USAID COTR OR DESIGNATE, have become so damaged as to be unfit for the use intended or specified shall be promptly removed from the site of the work and the CONTRACTOR shall receive no compensation for the damaged material or its removal.
- F. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored Products to assure that Products are maintained under specified conditions and free from damage or deterioration.
- G. Protection After Installation
 - 1. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove covering when no longer needed.
- H. The CONTRACTOR shall be responsible for all material and supplies sold and delivered to the project under this Contract until final inspection of the work and acceptance by the USAID COTR OR DESIGNATE. In the event any such material and supplies are lost, stolen, damaged, or destroyed prior to final inspection and acceptance, the CONTRACTOR shall replace same without additional cost to USAID.
- I. Should the CONTRACTOR fail to take proper action on storage and handling of materials supplied under this Contract within seven days after written notice to do so has been given, USAID retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from the CONTRACTOR's Contract. These costs may be comprised of expenditures for labor, equipment usage, administrative, clerical, engineering, and any other costs associated with making the necessary corrections.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01630

SUBSTITUTIONS AND PRODUCT OPTIONS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Furnish and install products specified, under options and conditions for substitutions stated in this section.
- B. Whenever a product, material or item of equipment is specified or described by using the name of a proprietary product or the name of a particular manufacturer or vendor, followed by the phrase "or equal," the specific item mentioned shall be the basis upon which bids are to be prepared, and shall be understood as establishing the type, function, dimension, appearance and quality desired. Other manufacturer's or vendor's products not named will be considered as substitutions, provided the required information is submitted in the manner set forth in this section and provided the substitution will not require substantial revision to the Contract Documents.

1.02 RELATED REQUIREMENTS

- A. Substitutions during the Bidding Period are included in Instructions to Bidders.
- B. Material and Equipment are included in Section 01610.

1.03 SUBMITTAL OF LIST OF PROPOSED SUBSTITUTIONS

- A. Bidders shall submit their list of proposed substitutions and the proposed monetary changes associated therewith to the USAID COTR OR DESIGNATE on the standard form provided together with their bids.

1.04 CONTRACTOR'S OPTIONS

- A. For products specified only by reference standard, select product meeting that standard, by any manufacturer.
- B. For products specified by naming several products or manufacturers, select any one of products and manufacturers named which complies with specifications.
- C. For products specified by naming one or more products or manufacturers and stating "or equal," submit a request as for substitutions, for any product or manufacturer which is not specifically named.
- D. For products specified by naming only one product and manufacturer, there is no option and no substitution will be allowed.

1.05 SUBSTITUTIONS

- A. Prior approval required. The CONTRACTOR must receive approval in writing from the USAID COTR OR DESIGNATE before substitutions (1) proposed by the CONTRACTOR but not yet approved at the time of execution of the contract, or (2) proposed by the CONTRACTOR after execution of the contract may be used in the project. Sufficient information to permit evaluation by the USAID COTR OR DESIGNATE must be accompany any substitution request including but not limited to the reasons for the proposed substitution and data concerning the design, appearance, performance, composition, and relative cost of the proposed substitute. The CONTRACTOR shall make requests for substitutions in a timely manner to permit adequate evaluation by the USAID COTR OR DESIGNATE. If, in the USAID COTR OR DESIGNATE 's opinion, the use of such substitute items is not in the best interests of USAID, the CONTRACTOR must obtain the items originally specified with no adjustment in the contract price or completion date.
- B. Approval through shop drawings. The CONTRACTOR may propose substitutions of materials in the submittal of shop drawings, provided such substitution is specifically requested in writing in the transmittal of the shop drawings to the USAID COTR OR DESIGNATE. Such substitution requests must be made in a timely manner and supported by the required information.
- C. Final approval on delivery. Acceptance or approval of proposed substitutions under the contract are conditioned upon approval of items delivered at the site or approval by sample. Approval by sample shall not limit the USAID COTR OR DESIGNATE's right to reject material after delivery to the site if the material does not conform to the approved sample in all material respects.
- D. Submit separate request for each substitution. Support each request with:
 - 1. Complete data substantiating compliance of proposed substitution with requirements stated in Contract Documents:
 - a. Product identification, including manufacturer's name and address.
 - b. MANUFACTURER's literature; identifying:
 - 1) Product description.
 - 2) Reference standards.
 - 3) Performance and test data.
 - 4) Operation and maintenance data.
 - c. Samples, as applicable.
 - d. Name and address of similar projects on which product has been used and date of each installation.

2. Itemized comparison of the proposed substitution with product specified; list significant variations. Substitution shall not change design intent and shall perform equal to that specified.
 3. Data relating to impact on construction schedule occasioned by the proposed substitution.
 4. Any effect of substitution on separate contracts.
 5. List of changes required in other work or products.
 6. Accurate cost data comparing proposed substitution with product specified.
 - a. Amount of any net change to Contract Sum.
 7. Designation of required license fees or royalties.
 8. Designation of availability of maintenance services, sources of replacement materials.
- E. Substitutions will not be considered for acceptance when:
1. They are indicated or implied on shop drawings or product data submittals without a formal request from CONTRACTORS.
 2. They are requested directly by a subcontractor or supplier.
 3. Acceptance will require substantial revision of Contract Documents.
- F. The USAID COTR OR DESIGNATE's decision regarding evaluation of substitutions shall be considered final and binding. Requests for time extensions and additional costs based on submission of, acceptance of, or rejection of substitutions will not be allowed. All approved substitutions will be incorporated into the Agreement by Change Order.

1.06 CONTRACTOR'S REPRESENTATION

- A. In making formal request for substitution, CONTRACTOR represents that:
1. He/she has investigated proposed product and has determined that it is equal to or superior in all respects to that specified.
 2. He/she will provide same warranties or bonds for substitution as for product specified.
 3. He/she will coordinate installation of accepted substitution into the Work and will make such changes as may be required for the Work to be complete in all respects.
 4. He/she waives claims for additional costs caused by substitution which may subsequently become apparent.

5. Cost data is complete and includes related costs under his/her Contract, but not:
 - a. Costs under separate contracts.
 - b. USAID COTR OR DESIGNATE's costs for redesign or revision of Contract Documents.

1.07 USAID COTR OR DESIGNATE DUTIES

- A. Review CONTRACTOR's requests for substitutions with reasonable promptness.
- B. Notify CONTRACTOR, in writing, of decision to accept or reject requested substitution.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
 - 1. Closeout procedures.
 - 2. Final cleaning.
 - 3. Adjusting.
 - 4. Project record documents.

1.02 RELATED REQUIREMENTS

- A. The Contract Documents include, but are not limited to, the following related sections:
 - 1. Project Record Documents are included in Section 01720.
 - 2. Warranties and Bonds are included in Section 01740.

1.03 RECORD DOCUMENTS

- A. Maintain on site, one set of the following documents; actual revisions to the Work shall be recorded in these documents:
 - 1. Contract Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other Modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
- B. Store Record Documents separate from documents used for construction.
- C. Record information concurrent with construction progress.
- D. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:

1. MANUFACTURER's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and Modifications.
- E. Contract Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths and lateral extents of excavations.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 4. Field changes of dimension and detail.
 5. Details not on original Contract Drawings.
- F. Submit documents to USAID COTR OR DESIGNATE with Application for Substantial Completion.
- G. Submit three copies, indexed and complete of all geotechnical test reports, field conformance test results, and material warranties at Substantial Completion.
- H. Submit five A1-size sets of certified site surveys and one electronic version of the surveys on AutoCAD Release 2008 or later for the various lifts, layers or tasks specified in Section 01050.

1.04 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for USAID COTR OR DESIGNATE's inspection.
- B. Provide submittals to USAID COTR OR DESIGNATE that are required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.05 FINAL CLEANING

- A. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

1. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even textured surface.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01710

CLEANING

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. CONTRACTOR shall execute cleaning, during progress of the Work, and at completion of the Work.

1.02 DISPOSAL REQUIREMENTS

- A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 DURING CONSTRUCTION

- A. Execute daily cleaning to keep the Work, the site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations.
- B. Provide onsite containers for the collection of waste materials, debris and rubbish. All waste materials including containers, food debris and other miscellaneous materials must be disposed of daily in onsite containers.
- C. Waste materials, debris and rubbish from the construction site shall be separated and stored on site in an approved area.
- D. Remove waste materials, debris and rubbish from the site periodically (at a minimum of once every 7 days) and dispose of at legal disposal areas away from the site.

3.02 FINAL CLEANING

- A. Employ skilled workmen for final cleaning.
- B. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.
- C. Prior to substantial completion, or OWNER acceptance, CONTRACTOR shall conduct an inspection of sight-exposed interior and exterior surfaces, and all work areas, to verify that the entire Work is clean.

END OF SECTION

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SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. CONTRACTOR shall maintain at the site for the USAID COTR OR DESIGNATE one record copy of:
1. Drawings.
 2. Specifications.
 3. Addenda.
 4. Change Orders and other Modifications to the Contract.
 5. USAID COTR OR DESIGNATE's Field Orders or written instructions.
 6. Approved Shop Drawings, Working Drawings and Samples.
 7. Field Test records.
 8. Construction photographs.
 9. Detailed Progress Schedule.

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Store documents and samples in CONTRACTOR's field office apart from documents used for construction.
1. Provide files and racks for storage of documents.
 2. Provide locked cabinet or secure storage space for storage of samples.
- B. File documents and samples in accordance with Construction Specification Institute (CSI) format.
- C. Maintain documents in a clean, dry, legible, condition and in good order. Do not use record documents for construction purposes.
- D. Make documents and samples available at all times for inspection by the USAID COTR OR DESIGNATE.
- E. As a prerequisite for monthly progress payments, the CONTRACTOR is to exhibit the currently updated "record documents" for review by the USAID COTR OR DESIGNATE.

1.03 MARKING DEVICES

- A. Provide felt tip marking pens for recording information in the color code designated by the USAID COTR OR DESIGNATE. Color CAD drawings will also be accepted.

1.04 RECORDING

- A. Label each document "PROJECT RECORD" in neat large printed letters.
- B. Record information concurrently with construction progress.
 - 1. Do not conceal any work until required information is recorded.
- C. Drawings – Legibly mark in red to record actual construction:
 - 1. Elevations of various structure elements in relation to grade.
 - 2. All underground piping with elevations and dimensions; changes to piping location; horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements; actual installed pipe material, class, etc.
 - 3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
 - 4. Field changes of dimension and detail.
 - 5. Changes made by Field Order or by Change Order.
 - 6. Details not on original contract drawings.
 - 7. All locations shall be referenced to the coordinate system shown on the Drawings and established for the site.
- D. Specifications and Addenda – Legibly mark each Section to record:
 - 1. MANUFACTURER, trade name, catalog number, and Supplier of each Product and item of equipment actually installed.
 - 2. Changes made by Field Order or by Change Order.
- E. Shop Drawings (after final review):
 - 1. One complete set of record shop drawings.
- F. See requirements of 01050 for as-built surveying requirements.

1.05 SUBMITTAL

- A. Prior to Contract Substantial Completion, deliver the Record Documents to the USAID COTR OR DESIGNATE.
- B. Accompany submittal with transmittal letter in duplicate, containing:
 - 1. Date.
 - 2. Project title and number.
 - 3. CONTRACTOR's name and address.
 - 4. Title and number of each Record Document.
 - 5. Signature of CONTRACTOR or his authorized representative.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01740

WARRANTIES AND BONDS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including MANUFACTURER's standard warranties on products and special warranties.

1.02 RELATED REQUIREMENTS

- A. The Contract Documents include, but are not limited to, the following related sections:
 - 1. Refer to Conditions of Contract for the general requirements relating to warranties and bonds.
 - 2. General closeout requirements are included in Section 01700 Contract Closeout.
 - 3. Specific requirements for warranties for the Work and products and installations that are specified to be warranted are included in the individual Sections.

1.03 SUBMITTALS

- A. Submit written warranties to the USAID COTR OR DESIGNATE prior to the date fixed for Final Acceptance. If a commencement date for warranties other than the date of Final Acceptance for the Work, or a designated portion of the Work, is specified, submit written warranties upon request of the USAID COTR OR DESIGNATE.
- B. When a designated portion of the Work is completed and occupied or used, by separate agreement with the CONTRACTOR during the construction period, submit properly executed warranties to the USAID COTR OR DESIGNATE within 15 days of completion of that designated portion of the Work.
- C. At Final Acceptance, compile two copies of each required warranty and bond properly executed by the CONTRACTOR, or by the CONTRACTOR's subcontractor, supplier, or MANUFACTURER. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- D. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive A4-size paper.
- E. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification Section in which specified, and the name of the product or work item.

- F. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer, supplier and MANUFACTURER.
- G. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the Project title or name, and the name, address and telephone number of the CONTRACTOR.

1.04 WARRANTY REQUIREMENT

- A. **Related Damages and Losses:** When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. **Reinstatement of Warranty:** When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. **Replacement Cost:** Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The CONTRACTOR is responsible for the cost of replacing or rebuilding defective Work regardless of whether USAID has benefited from use of the Work through a portion of its anticipated useful service life.
- D. **USAID's Recourse:** Written warranties made to USAID are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which USAID can enforce such other duties, obligations, rights, or remedies.
- E. **Rejection of Warranties:** USAID and USAID COTR OR DESIGNATE reserve the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the contract Documents.
- F. USAID and the USAID COTR OR DESIGNATE reserve the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- G. **Disclaimers and Limitations:** MANUFACTURER's disclaimers and limitations on product warranties do not relieve the CONTRACTOR of the warranty on the Work that incorporates the products, nor does it relieve suppliers, MANUFACTURER's, and subcontractors required to countersign special warranties with the CONTRACTOR.
- H. **Separate Prime Contracts:** Each Prime CONTRACTOR is responsible for warranties related to its own Contract.

1.05 DEFINITIONS

- A. Standard Product Warranties are preprinted written warranties published by individual MANUFACTURERS for particular products and are specifically endorsed by the MANUFACTURER to USAID.
- B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for USAID.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 02050

DEMOLITION

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to demolish, remove and dispose of work shown on the Drawings and as specified herein.
- B. Included, but not limited to, are demolition and removal of existing materials, equipment or work necessary to install the new work as shown on the Drawings and as specified herein and to connect with existing work in approved manner.
- C. Demolition and removals which may be specified under other Sections shall conform to requirements of this Section.
- D. Demolition includes:
 - 1. Concrete covering over Mixing and Loading Area.
 - 2. Concrete sediment basins in Storage Area.
 - 3. Asphalt paving in the IPTD pile structure and drainage ditch area, including base rock and subbase as needed. Provide a clean, sawn edge and protect adjacent paving to remain. Use care to protect edge to remain as saw-cut edge will remain as a finished edge.
 - 4. Structures and pads located in Storage Area.
 - 5. Concrete lining in Drainage Ditch.
 - 6. Wall located to the west of the proposed IPTD pile structure and fencing along the north side of the Storage Area.
 - 7. Existing trees and vegetation to be removed prior to excavation and construction of IPTD laydown area, pile structure, and access road as shown in the drawings.
 - 8. Remove and dispose of items including, but not limited to, any miscellaneous debris, structures, and infrastructure required to complete the Work.
- E. Blasting and the use of explosives will not be permitted for any demolition work.

1.02 RELATED WORK

- A. Summary of Work is included in Section 01010.
- B. Environmental Protection Procedures are included in Section 01110.

- C. Submittals are included in Section 01300.
- D. Construction Schedule is included in Section 01310.
- E. Site Preparation is included in Section 02100.
- F. Earthwork is included in Section 02200.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, six copies of proposed methods and operations of demolition of the structures.
- B. Furnish a detailed sequence of demolition and removal work to ensure the uninterrupted progress of the Airport's operations. Sequence shall be compatible with sequence of construction as specified in Section 0114.
- C. Actual work shall not begin until the USAID COTR OR DESIGNATE has authorized commencement of the demolition work in writing.

1.04 JOB CONDITIONS

- A. Protection
 - 1. Execute the demolition and removal work to prevent damage or injury to structures, occupants thereof and adjacent features which might result from falling debris or other causes, and so as not to interfere with the use, and free and safe passage to and from adjacent structures.
 - 2. Closing or obstructing of roadways, sidewalks and passageways adjacent to the work by the placement or storage of materials will not be permitted and all operations shall be conducted with a minimum interference to traffic on these ways.
- B. Scheduling
 - 1. Carry out operations so as to avoid interference with operations and work in the existing airport operations.
- C. Notification
 - 1. At least 48 hours prior to commencement of a demolition or removal, notify the USAID COTR OR DESIGNATE in writing of proposed schedule. USAID COTR OR DESIGNATE shall inspect the existing equipment and to identify and mark those items which are to remain the property of the Airport. No removals shall be started without the permission of the USAID COTR OR DESIGNATE.

D. Conditions of Structures

1. USAID and the USAID COTR OR DESIGNATE assume no responsibility for the actual condition of the structures to be demolished.
2. Conditions existing at the time of inspection for bidding purposes will be maintained by the Airport insofar as practicable. However, variations within a structure may occur prior to the start of demolition work.

E. Repairs to Damage

1. Promptly repair damage caused to adjacent facilities by demolition operation when directed by the USAID COTR OR DESIGNATE and at no additional cost to USAID. Repairs shall be made to a condition at least equal to that which existed prior to construction.

F. Traffic Access

1. Conduct demolition and modification operations and the removal of equipment and debris to ensure minimum interference with roads, streets, walks both onsite and offsite and to ensure minimum interference with occupied or used facilities.
2. Special attention is directed towards maintaining safe and convenient access to the existing facilities by airport personnel and airport-associated vehicles.
3. Do not close or obstruct streets, walks or other occupied or used facilities without permission from the USAID COTR OR DESIGNATE. Furnish alternate routes around all closed or obstructed traffic in access ways.

1.05 RULES AND REGULATIONS

- A. Applicable building codes for Vietnam and Da Nang shall control the demolition, modification or alteration of the existing buildings or structures.
- B. If required by Vietnamese or local building codes, no building or structure, or any part thereof, shall be demolished until an application has been filed with the Building Inspector and a permit issued. The fee for this permit shall be the CONTRACTOR's responsibility.

1.06 DISPOSAL OF MATERIAL

- A. Salvageable material and equipment designated by the USAID COTR OR DESIGNATE shall become the property of the Airport. Dismantle all such items to a size that can be readily handled and deliver them to a designated storage area.
- B. All other material and items of equipment shall become the CONTRACTOR's property and must be removed from the site.
- C. The storage or sale of removed items on the site will not be allowed.

- D. Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the Airport's property, demolished materials shall become the CONTRACTOR's property and shall be removed from the site and be disposed of by the CONTRACTOR.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. All materials and equipment removed from existing work shall become the property of the CONTRACTOR, except for those which the USAID COTR OR DESIGNATE has identified and marked for the Airport's use. All materials and equipment marked by the USAID COTR OR DESIGNATE to remain shall be carefully removed, so as not to be damaged, cleaned and stored on or adjacent to the site in a protected place specified by the USAID COTR OR DESIGNATE.
- B. Dispose of all demolition materials, equipment, debris and all other items not marked by the USAID COTR OR DESIGNATE to remain, off the site and in conformance with all existing applicable laws and regulations.
- C. Environmental and Pollution Controls
 - 1. Material removed from locations containing contaminated soils and sediments shall be cleaned by the CONTRACTOR to remove potentially contaminated soil and sediment. All removed soil and sediment shall be placed in the IPTD pile structure for treatment. Material shall not be removed from the area until it has been inspected and approved by the USAID COTR OR DESIGNATE. The CONTRACTOR shall perform additional cleaning as necessary as directed by the USAID COTR OR DESIGNATE.
 - 2. Use water sprinkling, temporary enclosures and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Comply with governing regulations pertaining to environmental protection.
 - a. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding and pollution.
 - b. Clean adjacent structures, facilities, and improvements of dust, dirt and debris caused by demolition operations. Return adjacent areas to conditions existing prior to the start of the work.

3.02 CLEAN-UP

- A. Remove from the site all debris resulting from the demolition operations as it accumulates. Upon completion of the work, all materials, equipment, waste and debris of every sort shall be removed and premises shall be left, clean, neat and orderly.

END OF SECTION

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SECTION 02100

SITE PREPARATION

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials and equipment required to perform all site preparation, as shown on the Drawings and as specified herein.
- B. Obtain all permits required for site preparation work prior to proceeding with the work, including clearing and tree removal.
- C. Unless otherwise shown on the Drawings or directed by the USAID COTR OR DESIGNATE, clearing shall be performed in those areas having contaminated soils and sediments. Clearing, grubbing, and stripping shall be performed in the work areas outside of those having contaminated soils and sediments.

1.02 RELATED WORK

- A. Environmental Protection is included in Section 01110.
- B. Demolition is included in Section 02050.
- C. Earthwork is included in Section 02200.
- D. Seeding and Mulching is included in Section 02985.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, copies of all permits required prior to clearing, grubbing, and stripping work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CLEARING

- A. In non-contaminated areas, cut and remove all timber, trees, stumps, brush, shrubs, roots, grass, weeds, rubbish and any other objectionable material resting on or above the surface of the ground.
- B. In contaminated soil and sediment areas, cut and remove all vegetation down to the ground surface and remove any other objectionable material resting on or above the surface of the ground. Stumps and roots shall be removed as part of excavation of the contaminated material, mulched, and mixed in with contaminated soil and sediment to be placed in the IPTD pile structure. Mulched material placed in the IPTD pile structure shall be spread out in thin lifts not exceeding 15 cm in thickness. Mulched material shall

be distributed evenly as possible throughout the IPTD pile structure in order to eliminate concentrations of mulched debris. In any given location, the mulched material shall not be more than 25% of a cubic meter.

- C. Preserve and protect trees and other vegetation designated on the Drawings or directed by the USAID COTR OR DESIGNATE to remain as specified below.

3.02 DISPOSAL

- A. Dispose of material and debris from site preparation operations by hauling such materials and debris to an approved off-site disposal area. Material, debris, and vegetation obtained from areas having contaminated soils and sediments must be free of soil and sediment. Disposal shall be conducted in strict accordance with local requirements, subject to applicable permit requirements. No rubbish or debris of any kind shall be buried on the site.
- B. On-site disposal of cleared and grubbed materials by open-air burning is not permitted.

3.03 PROTECTION

- A. Conduct clearing operations in a manner to prevent falling trees from damaging trees and vegetation outside of the area to be cleared and to the work being constructed and so as to provide for the safety of employees and others.
- B. Maintain protection until all work in the vicinity of the work being protected has been completed.
- C. Do not operate heavy equipment or stockpile materials within the branch spread of existing trees.
- D. Immediately repair any damage to existing tree crowns, trunks, or root systems. Roots exposed and/or damaged during the work shall immediately be cut off cleanly inside the exposed or damaged area.
- E. When work is completed, remove all dead and downed trees. Live trees shall be trimmed of all dead and diseased limbs and branches. All cuts shall be cleanly made at their juncture with the trunk or preceding branch without injury to the trunk or remaining branches.
- F. Restrict construction activities to those areas within the limits of construction designated on the Drawings.

END OF SECTION

SECTION 02140

DEWATERING AND DRAINAGE

PART 1 GENERAL

1.00 STATUTORY REQUIREMENTS

- A. Obtain and pay for all permits required for temporary dewatering and drainage systems.
- B. Original permits shall be prominently displayed on the site prior to constructing dewatering and drainage systems.

1.01 SCOPE OF WORK

- A. Design, furnish, install, operate, monitor, maintain and remove temporary dewatering and drainage systems as required and lower and control water levels at least 60 cm below sub-grades of excavations and to permit construction to proceed in-the-dry.
- B. Furnish, maintain, and remove temporary surface water control measures adequate to drain and remove surface water entering excavations.
- C. Retain the services of a professional engineer to prepare dewatering and drainage system designs and submittals described herein.
- D. Collect and properly dispose of all discharge water from dewatering and drainage systems as specified herein and in accordance with national and local requirements and permits.
- E. Repair damage caused by dewatering and drainage system operations.
- F. Remove temporary dewatering and drainage systems when no longer needed. Restore all disturbed areas.
- G. Work shall include the design, equipment, materials, installation, protection, and monitoring of geotechnical instrumentation required to monitor the performance of the dewatering and drainage system as required herein.

1.02 RELATED WORK

- A. Special Project Procedures are included in Section 01100.
- B. Submittals are included in Section 01300.
- C. Site Preparation is included in Section 02100.
- D. Earthwork is included in Section 02200.
- E. Sedimentation and Erosion Control are included in Section 02270.
- F. Seeding and Mulching is included in Section 02985.

1.03 SUBMITTALS

- A. Dewatering and drainage system designs shall be prepared by a professional engineer retained by the CONTRACTOR. The CONTRACTOR shall submit an original and three copies of the professional engineer's certification. The CONTRACTOR shall also submit qualifications as required herein.
- B. The CONTRACTOR shall submit a dewatering and drainage system design plan. The plan shall include a description of the proposed dewatering system and include the proposed installation methods and procedures to be used for dewatering and drainage system elements and for observation wells. The plan shall include equipment, drilling methods, holes sizes, filter sand placement techniques, sealing materials, development techniques, the number and location of dewatering points and observations wells, location of drainage disposal, filtering method, etc. Include the dewatering system design calculations in the plan.
- C. The plan shall identify the anticipated area influenced by the dewatering system and address impacts to adjacent existing and proposed structures. The report shall also include provisions to address settlement of existing structures resulting from dewatering activities and coordinate settlement monitoring of existing structures with submittal of Section 02200.
- D. Coordinate dewatering and drainage submittals with the Dredging/Excavation submittals. The submittals shall show the areas and depths of excavation to be dewatered.
- E. Do not proceed with any excavation or dewatering activities until the dewatering submittal has been approved by the USAID COTR OR DESIGNATE.

1.04 DEFINITIONS

- A. Where the phrase "in-the-dry" is used in this Section, it shall be defined as an excavation subgrade where the groundwater level has been lowered to at least 60 cm below the lowest level of the excavation, is stable with no ponded water, mud, or muck and shall be able to support construction equipment without rutting or disturbance and shall be suitable for the placement and compaction of fill material or concrete masonry unit containment wall.

1.05 QUALITY ASSURANCE

- A. Regulations: Perform all work in accordance with current applicable regulations and codes of all national and local agencies.
- B. The CONTRACTOR shall have at least 5 years of experience with work compatible to the Work shown and specified, employing labor and supervisory personnel who are similarly experienced in this type of Work.
- C. The CONTRACTOR's design engineer shall have a minimum of 5 years of professional experience in the design and construction of dewatering and drainage systems and shall have completed not less than 5 successful dewatering and drainage projects of equal type, size, and complexity to that require for the work.

1.06 DESIGN REQUIREMENTS

- A. The CONTRACTOR is responsible for the proper design and implementation of methods for controlling surface water and groundwater.
- B. The primary purpose of the groundwater control system is to preserve the natural undisturbed condition of the subgrade soils in the areas of the proposed excavations. Prior to excavation, the CONTRACTOR shall lower the groundwater to at least 60 cm below the lowest excavation subgrade elevation. Additional groundwater lowering may be necessary beyond the 60 cm requirement, depending on construction methods and equipment used and the prevailing groundwater and soil conditions. The CONTRACTOR is responsible for lowering the groundwater as necessary to complete construction in accordance with the plans and specifications at no additional cost to the USAID COTR OR DESIGNATE.
- C. Design deep wells, well points and sumps, and all other groundwater control system components to prevent loss of fines from surrounding soils. Sand filters shall be used with all dewatering installations unless screens are properly sized by the CONTRACTOR's design engineer to prevent passage of fines from surrounding soils.
- D. The CONTRACTOR shall be responsible for damage to properties, buildings or structures, sewers and other utility installations, pavements and work that may result from dewatering or surface water control operations.
- E. Design review and field monitoring activities by the USAID COTR OR DESIGNATE shall not relieve the CONTRACTOR of his/her responsibilities for the work.
- F. The CONTRACTOR shall be responsible for meeting all permit conditions.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Pipe for observation wells shall consist of minimum 2.5 cm I.D. Schedule 40 PVC pipe and machine slotted PVC wellpoints, maximum slot size 0.5 mm.
- B. Piping, pumping equipment and all other materials required to provide control of surface water and groundwater in excavations shall be suitable for the intended purpose.
- C. Standby pumping systems and a source of standby power shall be maintained at all sites.

PART 3 EXECUTION

3.01 GENERAL

- A. Control surface water and groundwater such that excavation to final grade is made in-the-dry, the natural undisturbed condition of the subgrade soils are maintained, and softening and/or instability or disturbance due to the presence or seepage of water does not occur. All construction and backfilling shall proceed in-the-dry and flotation of completed portions of work shall be prohibited.

- B. Methods of groundwater control may include but are not limited to perimeter trenches and sump pumping, perimeter groundwater cutoff, well points, ejectors, deep wells and combinations thereof.
- C. Where groundwater levels are above the proposed bottom of excavation level, a pumped dewatering system will be required for predrainage of the soils prior to excavation, and for maintaining the lowered groundwater level until construction has been completed to such an extent that the fill will not be floated.
- D. It is expected that the type of system, spacing of dewatering units and other details of the work will have to be varied depending on soil/water conditions at a particular location.
- E. All work included in this Section shall be done in a manner which will protect adjacent structures and utilities and shall not cause loss of ground or disturbance to soils which support overlying or adjacent structures.
- F. Locate groundwater control system components where they will not interfere with construction activities adjacent to the work area or interfere with the installation and monitoring of geotechnical instrumentation including observation wells. Excavations for sumps or drainage ditches shall not be made within or below 1H:1V slopes extending downward and out from the edges of existing foundation elements.

3.02 SURFACE WATER CONTROL

- A. Construct surface water control measures, including dikes, ditches, sumps and other methods to prevent, as necessary, flow of surface water into excavations and to allow construction to proceed without delay.

3.03 EXCAVATION DEWATERING

- A. At all times during construction provide and maintain proper equipment and facilities to promptly remove and properly dispose of all water entering excavations. Excavations shall be maintained in-the-dry. Groundwater levels shall be kept at least 60 cm below the lowest excavation level.
- B. Excavation dewatering shall maintain the subgrade in a natural undisturbed condition and until the fill to be placed thereon have been completed to such extent that they will not be floated by allowing water levels to return to natural elevations.
- C. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed condition of the subgrade soils at the proposed bottom of excavation.
- D. If the subgrade of the excavation bottom becomes disturbed due to inadequate dewatering or drainage, excavate below normal grade as directed by the USAID COTR OR DESIGNATE and refill with structural fill, screened gravel or other material as approved by the USAID COTR OR DESIGNATE at the CONTRACTOR's expense.
- E. It is expected that the initial dewatering plan may have to be modified to suit the variable soil/water conditions to be encountered during construction. Dewater and excavate, at all times, in a manner which does not cause loss of ground or disturbance to soil which supports overlying or adjacent structures.

- F. Dewatering units used in the work shall be surrounded by suitable filter sand and no fines shall be removed by pumping. Pumping from the dewatering system shall be continuous until the excavation is adequately filled. Standby pumps shall be provided.
- G. Water entering the excavation from precipitation or surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to a sump and pumped from the excavation to maintain a bottom free from standing water.
- H. Drainage shall be disposed of in an approved area as specified in Section 01100. Existing or new sanitary sewers shall not be used to dispose of drainage.

3.04 WELL POINT SYSTEMS

- A. Where necessary, install a vacuum wellpoint system around the excavation to dewater the excavation. Each wellpoint and riser pipe shall be surrounded by a sand or gravel filter. Sand shall be of such a gradation that, after initial development of the wellpoints, the quantity and size of soil particles discharged shall be negligible. Wellpoint systems shall be capable of operating continuously under the highest possible vacuum.
- B. Installation of well point systems shall be in accordance with the approved submittal in the presence of the USAID COTR OR DESIGNATE.

3.05 DEEP WELLS

- A. Where necessary, install a deep well system around the excavation to dewater or depressurize the excavation. Each well shall be surrounded by a sand or gravel filter with adequate gradation such that after development, the quantity and size of soil particles discharged are negligible. Sufficient number of wells shall be installed to lower the groundwater level to allow excavation to proceed in-the-dry.
- B. Installation of deep well shall be in accordance with the approved submittal in the presence of the USAID COTR OR DESIGNATE.

3.06 OBSERVATION WELLS

- A. Install observation wells as required under this Section or in accordance with the approved submittal to monitor groundwater levels beneath and around the excavated area until work is completed.
- B. Observation Well Locations and Depths:
 - 1. Observation well(s) shall be located in critical areas with respect to groundwater control to monitor performance of dewatering systems designed by the CONTRACTOR's Engineer.
 - 2. Observation wells required shall be installed to a depth of at least 3.1 m below the deepest level of excavation, unless otherwise approved by the USAID COTR OR DESIGNATE, and to whatever depth is necessary to indicate that the groundwater control system designed by the CONTRACTOR's Engineer is performing as intended. Additional observation wells may be required by the USAID COTR OR DESIGNATE if deemed

necessary to monitor the performance of the CONTRACTOR's groundwater control system.

3. Locations and depths of observation wells are subject to approval by the USAID COTR OR DESIGNATE.
- C. Protect the observation wells at ground surface by providing a lockable box or outer protective casing with lockable top and padlock. Design the surface protection to prevent damage by vandalism or construction operations and to prevent surface water from infiltrating.
1. Provide two copies of keys for each padlock to the USAID COTR OR DESIGNATE for access to each well.
 2. Observation wells shall be developed so as to provide a reliable indication of groundwater levels. Wells shall be re-developed if well clogging is observed, in the event of apparent erroneous readings, or as directed by the USAID COTR OR DESIGNATE.
 3. Submittal observation well installation logs, top of casing elevation, and well locations to the USAID COTR OR DESIGNATE within 24 hours of completion of well installation.
- D. Observation Well Maintenance
1. The CONTRACTOR shall maintain each observation well until adjacent excavation are completed and filled. Clean out or replace any observation well which ceases to be operable before adjacent work is completed.
 2. It is the CONTRACTOR's obligation to maintain observation wells and repair or replace them at no additional cost to the USAID COTR OR DESIGNATE, whether or not the observation wells are damaged by the CONTRACTOR's operations or by third parties.
- E. Monitoring and Reporting of Observation Well Data
1. The CONTRACTOR shall monitor the groundwater levels daily in work areas where groundwater control is in operation shall continue until the work is completed and excavated areas are backfilled and until the time that groundwater control systems are turned off.
 2. The CONTRACTOR is responsible for processing and reporting observation well data to the USAID COTR OR DESIGNATE on a daily basis. Data is to be provided to the USAID COTR OR DESIGNATE on a form, which shall include the following information: observation well number, depth to groundwater, total depth of well, top of casing elevation, groundwater level elevation and date and time of reading.

3.07 DISPOSAL OF DRAINAGE

- A. All water discharged from temporary dewatering and drainage systems shall be disposed of in accordance with the sedimentation and erosion control provisions of these Specifications, and all applicable regulations and permits. Existing or new sanitary sewer systems shall not be used to dispose of drainage unless the written permission of the utility or owner is obtained.
- B. Dispose of drainage so that flow or seepage back into the excavated area will be prevented.

3.08 REMOVAL OF SYSTEMS

- A. At the completion of the excavation and backfilling work, and when approved by the USAID COTR OR DESIGNATE, all pipe, deep wells, wellpoints, pumps, generators, observation wells, other equipment and accessories used for the groundwater and surface water control systems shall be removed from the site. All materials and equipment shall become the property of the CONTRACTOR. All areas disturbed by the installation and removal of groundwater control systems and observation wells shall be restored to their original condition.
- B. Leave in place any casings for deep wells, wellpoints, or observation wells located within the plan limits of structures or pipelines or within the zone below 1H:1V planes extending downward and out from the edges of foundation elements or from the downward vertical footprint of the pipe, or where removal would otherwise result in ground movements causing adverse settlement to adjacent ground surface, utilities or existing structures.
- C. Where casings are pulled, holes shall be filled with sand. Where left in place, casings should be filled with cement grout and cut off a minimum of 1 m below finished ground level.
- D. When directed by the USAID COTR OR DESIGNATE, observation wells should be left in place for continued monitoring. When so directed, cut casings flush with final ground level and provide protective lockable boxes with locking devices. The protective boxes shall be suitable for the traffic and for any other conditions to which the observation wells will be exposed.

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SECTION 02200

EARTHWORK

PART 1 GENERAL

1.00 STATUTORY REQUIREMENTS

- A. All excavation shall comply with the requirements of national and local excavation safety standards. Where conflict between national and local regulations exists, the most stringent requirements shall apply.

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, supervision, and incidentals required and perform all earthwork, which includes clearing and stripping, procurement of fill material (on-site and imported), excavation at the excavation areas and at the In-Pile Thermal Desorption (IPTD) area, placing and compacting fill and backfill, transportation and storage of excess earthwork materials, disposal of unsuitable waste and surplus materials, and all subsidiary work necessary to complete the grading of the developed areas to conform with the lines, grades, and slopes shown on the Drawings and specified herein.
- B. The Work shall include, but not necessarily be limited to, excavation of contaminated soil, dewatering the soil and sediment, construction of a temporary dewatering pad and pile structure, stockpiling the excavated material and all related work in accordance with the Drawings and Specifications.
- C. Furnish and install temporary dewatering and surface water control systems and operate to dewater excavated material and maintain excavations in a dry condition, if required by the CONTRACTOR. Control drainage into excavations and remove seepage water and rainwater. Dewatering and surface water control shall be in accordance with Section 02140.
- D. Protection of existing structures and utilities.
- E. Provide the services of a licensed Engineer meeting the registration or licensing requirements in Vietnam, to prepare dewatering system designs and submittals.
- F. Wherever the requirement for compaction is referred to herein it shall mean minimum percentage of maximum density as determined by ASTM D1557.
- G. The CONTRACTOR shall obtain a pre-construction bathymetric survey of all areas to be excavated/dredged.

1.02 RELATED WORK

- A. Submittals are included in Section 01300.
- B. Site Preparation is included in Section 02100.
- C. Dewatering and Drainage is included in Section 02140.

- D. Seeding and Mulching is included in Section 02985.

1.03 SUBMITTALS

- A. Submit to the USAID COTR OR DESIGNATE, in accordance with Section 01300, the proposed methods of construction, including earthwork operations, excavation limits, fill material and dredged material moisture conditioning and handling, compaction equipment, and material sources for the various portions of the work. Coordinate this submittal with the submittals required by Section 02140 Dewatering and Drainage.
- B. The CONTRACTOR is responsible for design and execution of the means and methods for excavation and/or dredging in order to achieve target dredge depths, minimize re-suspension of sediments, minimize disturbance to local ecology, and meet the target moisture contents of soil and sediment to be treated. The CONTRACTOR shall develop and submit, in accordance with Section 01300, for review a Sediment Excavation Work Plan at least three weeks prior to the start of construction. The Work Plan shall include:
 - 1. Proposed sequencing, schedule, and means and methods of construction
 - 2. Mobilization and demobilization procedures throughout different construction seasons, excavation operations, excavation limits, sediment handling and transportation logistics and methods, backfilling method and material sources, descriptions and specification of equipment for excavation/dredging and material handling
 - 3. Proposed decontamination procedures
- C. The CONTRACTOR shall submit the results of the dewatering study demonstrating that the techniques for dewatering the excavated material will permit excess water to drain such that the required moisture content for thermal treatment of the excavated material specified herein can be met.
- D. The CONTRACTOR shall submit the results of a pre-construction bathymetric survey of all the excavation areas at least one month prior to the start of construction and the results of a post-construction bathymetric survey of all the excavation/dredging areas promptly after the completion of work specified herein. The survey shall be performed by a registered surveyor.
- E. Submit for the USAID COTR OR DESIGNATE's review and approval, the qualifications of the entity proposed to conduct geotechnical observation, testing and documentation. The submittal shall include qualifications of the firm and the resumes of the soil technician(s) assigned to the project and the geotechnical engineer in charge. The firm's qualifications shall meet ASTM D 3740. The soil technician shall have minimum three (3) years demonstrated experience in earthwork and grading operations and satisfy the certification requirements of agency having local jurisdiction. The USAID COTR OR DESIGNATE reserves the right to request substitution of soil technician(s) assigned to field work. Assigned soil technician(s) shall not be substituted without the prior approval of the USAID COTR OR DESIGNATE.
- F. Submit copies of field daily reports by the soil technician at the end of each work day while earthwork and grading operations are underway.

- G. Submit to the USAID COTR OR DESIGNATE, in accordance with Section 01300, complete product data for materials specified in this Section. For each material, the CONTRACTOR shall notify the USAID COTR OR DESIGNATE of the source of the material and shall deliver a representative sample weighing approximately 22.7 kg at least 15 calendar days prior to the date of anticipated use of such material.
- H. Submit laboratory test results for all fill materials (maximum density, gradation, Atterberg limits, etc., as applicable) at least 72 hours prior to importing or placing any fill.
- I. Upon completion of earthwork and grading operations, submit an as-graded plan showing the field density and moisture content test numbers and locations, a table of all field density and moisture content test results and depths, date tested, and a certification of compliance by the geotechnical engineer in charge.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM D422 – Test Method for Particle Size Analysis of Soils.
 - 2. ASTM D1556 – Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
 - 3. ASTM D1557 – Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
 - 4. ASTM D2487 – Standard Test Method for Classification of Soils for Engineering Purposes.
 - 5. ASTM D2922 – Density of Soil in Place by Nuclear Methods (Shallow Depth).
 - 6. ASTM D3017 – Test Method for Water Content of Soil in Place by Nuclear Methods (Shallow Depth).
 - 7. ASTM D3740 – Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
 - 8. ASTM D6938 – Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 PROTECTION

- A. Furnish, install, monitor and maintain dewatering and drainage systems as required and as specified in Section 02140.

- B. Take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects on groundwater quality.
- C. Except as indicated, the USAID COTR OR DESIGNATE has no knowledge of cables, pipes, or other artificial obstructions or of any wrecks, wreckage, or other material that would necessitate the employment of additional equipment for economical removal.
- D. The CONTRACTOR shall conduct a separate debris removal operation to remove any debris within the dredge/excavation limits that will obstruct and adversely impact the dredging/excavation operations under the methods and equipment proposed.

1.06 QUALITY ASSURANCE

- A. Regulations: Perform all work in accordance with current application regulations and codes of all national and local agencies.
- B. The CONTRACTOR shall have at least five (5) years experience with comparable work to the Work shown and specified, employing labor and supervisory personnel who are similarly experienced in the is type of work.
- C. The CONTRACTOR's surveyor shall be a Professional Land Surveyor meeting applicable licensing requirements in Vietnam and shall have at least five (5) years experience in construction survey of the type required under this Contract and acceptable to the USAID COTR OR DESIGNATE.

1.07 SOIL TESTING

- A. Materials will be tested and observed as described in the following paragraphs. Cooperate by allowing free access to the work for selection of test materials and observations.
 - 1. Materials to be used in the work shall be tested by a certified independent laboratory, engaged by the CONTRACTOR and acceptable to the USAID COTR OR DESIGNATE, to demonstrate conformance with the requirements of these Specifications. Such testing will be paid for by the CONTRACTOR. Deliver test reports and material certifications to the USAID COTR OR DESIGNATE before using any material in the work.
 - 2. If field test results are not in conformance with the requirements of these Specifications, costs of re-testing after correction of deficiencies shall be borne by the CONTRACTOR.
 - 3. Testing methods shall comply with the latest applicable ASTM Standards or equivalent local standards specified.
 - 4. During the placement of bedding, fill, and excavated soil and sediment backfill, the CONTRACTOR shall perform in-place soil density testing to confirm that these materials have been compacted in accordance with the requirements of this Section. The USAID COTR OR DESIGNATE may designate areas to be tested at the frequency specified herein. CONTRACTOR shall notify USAID COTR OR DESIGNATE at least 72 hours in advance of scheduled compaction testing.

5. Materials which have been previously tested may be subjected to further testing from time to time and may be rejected if it is determined that they do not conform to the requirements of these Specifications. Rejected materials shall be removed from the work immediately when so directed by the USAID COTR OR DESIGNATE, notwithstanding the results of previous testing.

1.08 DELIVERY STORAGE AND HANDLING

- A. If granular fill materials are delivered to the site prior to placement approval, materials shall be stockpiled as directed by the USAID COTR OR DESIGNATE. Provisions shall be implemented to minimize surface water impact on the off-site fill material stockpile. Removal and placement of granular fill materials shall be done in a manner to minimize intrusion of soils adjacent to the stockpile.

1.09 DEFINITIONS

- A. **Structures** are all buildings, manholes and below grade vaults and equipment capsules.
- B. **Percent Compaction** is the required in-place dry density of the material, expressed as a percentage of the maximum dry density of the same material, as determined in the laboratory by ASTM D1557 (Modified Proctor).
- C. **Optimum Moisture Content** is the moisture content (percent by dry weight) corresponding to the maximum dry density of the same material as determined by ASTM D1557.
- D. **In-the-Dry** is defined as an excavation subgrade where the groundwater level has been lowered to at least 2 feet below the lowest level of the excavation, is stable with no ponded water, mud, or muck and shall be able to support construction equipment without rutting or disturbance and shall be suitable for the placement and compaction of fill material.
- E. **Unsuitable Soil** includes organic soils, weak native soils, disturbed soils, or frozen soil.
- F. **Objectionable Material** includes topsoil, organic matter, contaminated soil, construction debris, perishable materials, snow, ice, and rocks or lumps of cemented soils over 6 inches in maximum dimension.
- G. **Subgrade** is the bottom surface of a trench or excavation extending to the underside of site improvements, including dimensioned fill, structures, paving, or other surfacing material.
- H. **Pass** shall mean a single complete coverage with compaction equipment over the entire surface of an exposed lift or subgrade being compacted.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Structural Fill shall be gravel, sandy gravel, or gravelly sand. Material shall have a plasticity index of less than 15 and shall conform to the following gradation limits:

<u>Sieve Size</u>	<u>Percent Finer By Weight</u>
75 mm	100
No. 4	20 to 70
No. 40	5 to 35
No. 200	0 to 10

- B. Common Fill shall consist of mineral soil, substantially free of clay, organic material, loam, wood, trash, snow, ice, frozen soil and other objectionable material which may be compressible, or which cannot be compacted properly. Common Fill shall not contain granite blocks, broken concrete, masonry rubble, asphalt pavement, or any material larger than 150 mm in any dimension. Common Fill shall have a plasticity index of less than 15 and shall conform to the following gradation limits:

<u>Sieve Size</u>	<u>Percent Finer By Weight</u>
No. 40	75 max.
No. 200	30 max.

- C. Select Common Fill shall conform to the requirements of Common Fill except that the material shall not contain any materials larger than 50 mm in largest dimension.
- D. Crushed Stone shall consist of sound, durable stone, free of any foreign material, angular in shape, free from structural defects and comparatively free of chemical decay. Crushed Stone shall be graded within the following limits:

<u>Sieve Size</u>	<u>Percent Finer by Weight</u>
16 mm	100
12.5 mm	40 to 100
9.5 mm	15 to 45
No. 10	0 to 5

- E. Filter Sand for use between the contaminated stockpile material and the gravel containing the drainage pipe for transporting leachate from the contaminated sediment during treatment shall be inorganic, non-calcareous sand free from organic matter and other deleterious material. Filter Sand shall be graded within the following limits:

<u>Sieve Size</u>	<u>Percent Finer By Weight</u>
75 mm	100
19 mm	100
No. 4	90-100
No. 10	65-85
No. 40	45-60
No. 100	30-40
No. 200	0-5

- F. Excavated sediment shall consist of the material excavated from Sen Lake, the Eastern Wetlands, and Drainage Ditch (Sediment) as shown on the Drawings.
- G. Excavated soil shall consist of the material excavated from the Mixing and Loading Area, Storage Area, Drainage Ditch (Soil), Area Between Drainage Ditch and Eastern Wetland, and the Pacer Ivy Storage Area as shown on the Drawings.

PART 3 EXECUTION

3.01 GENERAL

- A. Dewatering and Drainage Systems
 1. Temporary dewatering and drainage systems shall be in place and operational prior to beginning excavation work and in accordance with Section 02140, if the CONTRACTOR elects to perform dredging and excavation work in-the-dry.
 2. The temporary dewatering pad shall be constructed and operational prior to beginning excavation work and in accordance with Section 02140.

3.02 GENERAL EXCAVATION PROCEDURES (ROADWAYS, IPTD AREA)

- A. Excavation shall extend to the depth and within the limits shown on the Drawings or as specified herein.
- B. Excavation shall be performed in-the-dry and shall be accomplished by methods which preserve the undisturbed state of subgrade soils.
- C. Excavation equipment shall be satisfactory for carrying out the work in accordance with the requirements specified.
- D. Subgrade soils which become soft, loose, "quick", or otherwise unsatisfactory as a result of inadequate excavation, dewatering or other construction methods shall be removed and replaced by structural fill or crushed stone fill as required by the USAID COTR OR DESIGNATE at the CONTRACTOR's expense.
- E. Remove from the excavated all materials which the USAID COTR OR DESIGNATE may deem unsuitable for backfilling.

3.03 SUBGRADE PREPARATION

- A. Completely strip all topsoil and material containing roots away from areas which have been cleared and grubbed. Topsoil which is determined by the USAID COTR OR DESIGNATE to be suitable for future use by the OWNER shall be stripped separately and stockpiled at locations on the site as directed by the USAID COTR OR DESIGNATE. Topsoil which is not selected by the USAID COTR OR DESIGNATE for stockpiling shall become the property of the CONTRACTOR and shall be removed from the site to the CONTRACTOR'S own place of disposal at no additional cost to the OWNER.
- B. The subgrade shall be graded in accordance with the Contract Drawings.
- C. The subgrade shall be proofrolled by the CONTRACTOR under the direction and observation of the USAID COTR OR DESIGNATE.
- D. Select Common Fill, used to replace the stripped topsoil, shall be compacted to at least the established target density specified herein to create a stable subbase for pile structure placement.
- E. The USAID COTR OR DESIGNATE shall observe and approve the subgrade and survey plan of subgrade elevation submitted by the CONTRACTOR before installation of the Select Common Fill can proceed. It will be the CONTRACTOR'S responsibility to properly prepare and maintain the subgrade in a uniform and compacted condition during installation of the Select Common Fill.

3.04 SEDIMENT AND SOIL (CONTAMINATED MATERIAL) EXCAVATION PROCEDURES

- A. Excavation shall extend to the depth and within the limits shown on the Drawings or as specified herein.
- B. Excavation shall be performed in-the-dry and shall be accomplished by methods which preserve the undisturbed state of the subgrade soils. If the CONTRACTOR cannot lower the water level to 60 cm below the prepared subgrade, the CONTRACTOR shall lower the water level to the prepared subgrade elevation, which may require mud mats and/or low-pressure equipment to perform the work.
- C. Excavation equipment shall be satisfactory for carrying out the work in accordance with the requirements specified.
- D. Soil and sediment excavation on side slopes shall maintain a 3 horizontal to 1 vertical (3H:1V) slope and follow, as closely as practicable, the lines indicated on the Drawings. Steeper slopes may be permitted and approved by the USAID COTR OR DESIGNATE after the CONTRACTOR has submitted supporting data and calculations justifying the steeper slope. The amount of material excavated from the side slopes will be determined by either cross-sections or computer, or both.

3.05 GENERAL FILLING AND BACKFILLING PROCEDURES

- A. Fill, excavated soil, and excavated sediment backfill materials shall be placed in lifts to suit the specified compaction requirements to the lines and grades required, making allowances for

settlement and placement of cover materials (i.e. stockpile cap). Soft spots or uncompacted areas shall be corrected.

- B. Fill, excavated soil, and excavated sediment backfill materials shall not be placed on frozen surfaces, or surfaces covered by snow or ice. Fill and backfill material shall be free of snow, ice and frozen earth.
- C. Fill shall not be placed over organic soils (including peat and topsoil) and loose inorganic silt material. These materials shall be removed prior to fill placement as specified in this section unless approved by the USAID COTR OR DESIGNATE.
- D. Compaction of fill and soil and sediment backfill in open areas shall consist of fully-loaded ten-wheel trucks, a tractor dozer weighing at least 13, 600 kg, a heavy vibratory roller, or any method approved by the USAID COTR OR DESIGNATE. Compaction of sediment backfill and fills in confined areas shall be accomplished by hand operated vibratory equipment or mechanical tampers approved by the USAID COTR OR DESIGNATE. As a minimum, compaction of fills shall consist of at least four coverages of the approved equipment, unless otherwise specified.
- E. Common Fill shall be placed in layers having a maximum thickness of 0.3 meters measured before compaction and shall be compacted to 90 percent of the modified Proctor (ASTM D1557) maximum dry density, or as otherwise directed by the USAID COTR OR DESIGNATE.
- F. Select Common Fill shall be placed in layers having a maximum thickness of 0.25 meters measured before compaction and shall be compacted to 95 percent of the modified Proctor (ASTM D1557) maximum dry density, or as otherwise directed by the USAID COTR OR DESIGNATE.
- G. Compacted Stone (structural fill or crushed stone) shall be placed in layers having a maximum thickness of 0.15 meters measured before compaction and shall be compacted to 95 percent of the modified Proctor (ASTM D1557) maximum dry density. Broken pieces of concrete, asphalt, or brick are not acceptable.
- H. Filter Sand shall be placed in layers having a maximum thickness of 0.15 meters measured before compaction and shall be compacted to 95 percent of the modified Proctor (ASTM D1557) maximum dry density.
- I. Excavated soil and sediment backfill shall be placed in layers having a maximum thickness of 0.3 meters measured before compaction and shall be compacted to 90 percent of the modified Proctor (ASTM D1557) maximum dry density. Soil and sediment removed from the areas designated on the Drawings shall be dewatered by gravity drainage within the temporary storage pad area shown on the Drawings to moisture contents of 15 percent, by mass, for excavated the soil and 43 percent, by mass, for the excavated sediment prior to being placed in the pile structure.
- J. Excluding Sen Lake and the Eastern Wetlands, areas excavated shall be backfilled with common fill to existing grade immediately after the completion of each work zone.

- K. Fill, excavated soil, and excavated sediment backfill shall not be placed and compacted when the materials are too wet to properly compact either from rain or from excess application of water (i.e. the in-place moisture content of the soil at that time is no more than three percentage points above the specified thermal treatment moisture content of that soil as determined by the laboratory test of the moisture-density relation appropriate to the specified level of compaction). At such times, work shall be suspended until the previously placed and new materials have dried sufficiently to permit proper compaction.
- L. Notify the USAID COTR OR DESIGNATE in advance of compaction activities and make prepared surfaces available to the USAID COTR OR DESIGNATE for observation and testing.
- M. Dust control measures shall be employed at all times.

3.06 SURVEYING

- A. The CONTRACTOR shall establish reference points, surveying lines, elevation points, monuments, markers, etc. required to locate the excavation limits, monitoring points, site boundaries, etc.
- B. Surveys Before Work – The CONTRACTOR shall perform a pre-construction bathymetric survey of the excavation/dredging areas. The CONTRACTOR shall submit to the USAID COTR OR DESIGNATE the results of the pre-construction survey.
- C. Surveys During Progress of Work – The CONTRACTOR shall survey and monitor the location and elevation of the excavation/dredging constantly. The operator shall be provided with the location and elevation information constantly in order to guide him/her on where to excavate/dredge and to ensure the excavation limits are reached, but not exceeded.
- D. Post-Construction Survey – The CONTRACTOR shall perform a post-construction bathymetric survey of the excavation/dredging areas. The CONTRACTOR shall submit to the USAID COTR OR DESIGNATE the results of the post-construction survey.

3.07 QUALITY CONTROL TESTING

- A. All holes made as a result of depth measurements, density tests, grade stakes or other activities shall be completely filled by the CONTRACTOR with compacted stone material as instructed by the USAID COTR OR DESIGNATE.
- B. Any area tested shall be rejected, removed and replaced if it does not meet the compaction requirements specified herein.
- C. The CONTRACTOR shall submit to the USAID COTR OR DESIGNATE at the end of each day a plan showing the location of the field density test samples.
- D. Geotechnical soil testing for the Common Fill, Select Common Fill, Filter Sand, and Structural Fill prior to delivery to the site, and for the Common Fill, Structural Fill, and excavated soil and sediment backfill during construction shall be performed at the following specified frequencies:

Type of Test	Testing Method	Testing Frequency ¹
1. Testing to be conducted prior to delivery of the material to the site		

Natural Moisture Content	ASTM D-2216	1/4000 cubic meters
Sieve Analysis	ASTM D-422	1/4000 cubic meters
Soil Classification	ASTM D-2487	1/4000 cubic meters
Modified Proctor Test	ASTM D-1557	1/4000 cubic meters
2. Testing to be conducted during construction		
Field Density using nuclear density gage	ASTM D-6938	1/lift/900 square meters ²
Field Moisture Content using nuclear density gage	ASTM D-6938	1/lift/900 square meters
Field Density using sand-cone density apparatus	ASTM D-1556	1/lift/9000 square meters ³

- E. Note that the nuclear density gages shall be calibrated within one year from the testing date. The nuclear gage certificates shall be provided to the Engineer prior to any testing.

Notes:

1. If there is a change in the source or supply of material during construction, additional samples will be collected and tested for natural moisture content (ASTM D-2216), sieve analysis (ASTM D-422), Atterberg Limits (ASTM D-4318), and Soil Classification (ASTM D-2487).
2. The test frequency shall be increased to 1/lift/50 square meters in areas compacted using hand-operated machines.
3. The test frequency shall be increased to 1/lift/450 square meters in areas compacted using hand-operated machines.

3.08 DISPOSAL OF MATERIAL

- A. Excavated material shall be dewatered, as necessary, temporarily stockpiled while undergoing treatment, then placed in borrow piles at designated locations at the site for future use. Materials shall be neatly piled so as to inconvenience, as little as possible, the Airport, the public and adjoining property owners until used or otherwise disposed of as specified below.
- B. It is expressly understood that no excavated material shall be removed from the site of the work or disposed of, except as directed by the USAID COTR OR DESIGNATE. When removal of surplus materials has been approved by the USAID COTR OR DESIGNATE, dispose of such surplus material in approved designated areas.
- C. Remove and dispose of all pieces of ledge and boulders which are not suitable for use in other parts of the work. Rock disposed of by hauling away to spoil areas is to be replaced by approved surplus excavation obtained elsewhere on the work, insofar as it is available. Any deficiency in the backfill material shall be made up with acceptable material approved by the USAID COTR OR DESIGNATE.
- D. Surplus imported fill shall become the property of the CONTRACTOR and shall be removed and disposed off site.

3.09 GRADING

- A. Grading shall be performed to the lines, grades and elevations shown on the Drawings and in accordance with the CONTRACTOR's approved submittal of final site grades. During the process of grading, the area to be graded shall be maintained in such condition that it shall be well drained at all times. When directed, temporary drains and drainage ditches shall be installed to intercept or divert surface water that may affect the prosecution or condition of the work.
- B. If at the time of grading it is not possible to place any material in its final location, it shall be stockpiled in approved areas for later use. No extra payment will be made for the stockpiling double handling of excavated material.

END OF SECTION

SECTION 02270

SEDIMENTATION AND EROSION CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The CONTRACTOR shall furnish all labor, materials, equipment, and incidentals necessary to perform all installation, maintenance, removal, and area cleanup related to sedimentation control work as shown on the Drawings and as specified herein or as required to prevent the transport of silt or sediment outside the limits of construction. The work shall include, but not necessarily be limited to, installation of temporary access ways and staging areas, silt fences, temporary seeding, turbidity barriers, sediment removal and disposal, device maintenance, removal of temporary devices, temporary mulching, and final cleanup.
- B. Temporary erosion controls may include, but are not limited to surface stabilization which shall be accomplished with vegetation and mulch, erosion matting, temporary earthen diversion berms, silt fencing, sediment traps, rock dams, riprap apron protection, and minimization of disturbed acreage. The performance of CONTRACTOR's erosion controls is subject to approval by USAID COTR OR DESIGNATE.
- C. Stockpiles shall be protected from transfer of material due to erosion by providing silt fencing along the toe of the slopes, using slope downdrains for long, steep slopes, and by maintaining stable slopes.

1.02 RELATED REQUIREMENTS

- A. The Contract Documents include, but are not limited to, the following related sections:
 - 1. Remediation Work Plan.
 - 2. Environmental Protection is included in Section 01110.
 - 3. Permits are included in Section 01111.
 - 4. Earthwork is included in Section 02200.
 - 5. Seeding and Mulching is included in Section 02985.

1.03 SUBMITTALS

- A. Within ten (10) days after award of Contract, the CONTRACTOR shall submit to the USAID COTR OR DESIGNATE for approval, technical product literature for all commercial products to be used for sedimentation and erosion control.
- B. Within ten (10) days after award of Contract, the CONTRACTOR shall submit in accordance with the Remediation Work Plan to the USAID COTR OR DESIGNATE for

approval the Site-Wide Environmental Protection Plan which includes provisions for erosion, sediment, and stormwater control.

1.04 QUALITY ASSURANCE

- A. The CONTRACTOR shall be responsible for the timely installation and maintenance of all sedimentation control devices necessary to prevent the movement of sediment from the construction site to offsite areas via surface runoff. Measures in addition to those shown on the Drawings necessary to prevent the movement of sediment outside the limits of construction shall be installed, maintained, removed, and cleaned up at the expense of the CONTRACTOR. No additional charges to USAID will be considered.
- B. Sedimentation and erosion control measures shall conform to the Best Management Practices outlined in the Drawings and as required by local or Vietnamese regulations.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Silt Fence
 - 1. Steel posts or wooden posts shall be a minimum of 1.5-m in length, 6-cm by 6-cm by 6-mm angle post with self-fastening tabs and a 12-cm by 10-cm (nominal) steel anchor plate at bottom.
 - 2. Welded wire fabric shall be 10-cm by 10-cm mesh of 12-gauge by 12-gauge steel wire.
 - 3. Silt fence fabric shall be a woven, polypropylene, ultraviolet resistant material such as Mirafi 100X as manufactured by Mirafi, Inc., Charlotte, NC; Amoco style 1198 as manufactured by Amoco Fabrics and Fibers Co., Atlanta, GA; or approved equal.
 - 4. Tie wires for securing silt fence fabric to wire mesh shall be light gauge metal clips, or 0.8-mm diameter soft aluminum wire.
 - 5. Prefabricated commercial silt fence may be substituted for built-in-field fence. Prefabricated silt fence shall be "Envirofence" as manufactured by Mirafi Inc., Charlotte, NC; Landsaver LS25 by Amoco; or approved equal.
- B. Turbidity barriers shall be provided. Turbidity barrier may be floating or staked, based on the conditions at the location for installation. Turbidity barrier shall be capable of functioning properly for flow conditions up to a 5-year/24-hour storm event. Turbidity barriers shall be constructed of PVC or polypropylene material, all portions which will be exposed to direct sunlight shall be ultraviolet resistant. All metal components shall be corrosion resistant. Woven materials may be acceptable for installations where high flow conditions may exist during storm events. Turbidity barriers shall be "Mark I", "Mark II", or "PC-2" as manufactured by American Boom & Barrier Corporation, Cape Canaveral,

FL; "Type I" or "Type II" as manufactured by Aer-Flo Canvas Products Inc., Bradenton, FL; or approved equal.

- C. Straw mulch shall be utilized on all newly graded areas to protect areas against washouts and erosion. Straw mulch shall be comprised of threshed straw of oats, wheat, barley, rye, or hay that is free from noxious weeds, mold or other objectionable material. The straw mulch shall contain at least 50 percent by weight of material to be 10-in or longer. Straw shall be in an air-dry condition and suitable for placement with blower equipment.
- D. Latex acrylic copolymer, such as Soil Sealant with coalescing agent as manufactured by Soil Stabilization Co., Merced, CA or approved equivalent shall be used as straw mulch tackifier.
- E. An asphalt tackifier may be used in place of a latex acrylic copolymer with prior written approval from the USAID COTR OR DESIGNATE.
- F. Temporary Sod: This work shall consist of furnishing and placing sod within areas designated by the USAID COTR OR DESIGNATE, in order to temporarily control erosion. If the sod is determined to be of a temporary nature, at the discretion of the USAID COTR OR DESIGNATE the requirements for fertilizer and lime may be eliminated. The sod shall be kept in a moist condition in order to ensure growth.
- G. Baled Hay or Straw: This work shall consist of construction of baled hay or straw dams to protect against downstream accumulations of silt. The baled hay or straw dams shall be constructed in accordance with the details on the Drawings and applicable local or Vietnamese regulations.

PART 3 EXECUTION

3.01 LOCATION OF SEDIMENT/EROSION CONTROL AND TURBIDITY BARRIERS

- A. At a minimum, sediment/erosion control devices shall be installed at all locations shown on the plans.
- B. Sediment/erosion control devices shall be installed at 150-meter intervals along all swales and ditches constructed and around all installed drainage structures prior to placement of sod.
- C. CONTRACTOR shall provide additional sediment/erosion control and turbidity barriers as needed to control the transport of silt and sediments outside of the limits of construction.
- D. Sediment/erosion control shall be installed around the base of all soil stockpile areas.

3.02 INSTALLATION

A. Silt Fence Installation

1. Silt fences shall be positioned as indicated on the Drawings and as necessary to prevent movement of sediment produced by construction activities outside of the limits of construction or as approved.
2. Dig trench approximately 15-cm wide and 15-cm deep along proposed fence lines.
3. Drive metal stakes, 2-m on center (maximum) at back edge of trenches. Stakes shall be driven 60 cm (minimum) into ground.
4. Hang 10 by 10 woven wire mesh on posts, setting bottom of wire in bottom of trench. Secure wire to posts with self-fastening tabs.
5. Hang filter fabric on wire carrying to bottom of trench with about 10 cm of fabric laid across bottom of trench. Stretch fabric fairly taut along fence length and secure with tie wires 30-cm O.C. both ways.
6. Backfill trench with excavated material and tamp.
7. Install pre-fabricated silt fence according to MANUFACTURER's instructions.

B. Haybale Barrier

1. Bales shall be either wire-bound or string-tied with the bindings oriented around the sides rather than over and under the bales.
2. Bales shall be placed lengthwise in a single row with the ends of adjacent bales tightly abutting one another.
3. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 10 cm. After bales are staked and chinked, the excavated soil shall be backfilled against the barrier. Backfilled material shall conform to the ground level on the downhill side and shall be built up to 5 cm against the uphill side.
4. Each bale shall be securely anchored by at least two stakes or rebars driven through the bale. The first stake shall be driven toward the previously laid bale to force the bales together. Stakes shall be driven deep enough into the ground to securely anchor the bales.
5. The gaps between each bale shall be chinked (filled by wedging) with straw to prevent water from escaping between the bales.

C. Turbidity Barriers

1. Turbidity barriers should extend the entire depth of the water.

2. Turbidity barriers should not be placed perpendicular to flow. Barriers should be installed at an angle to the flow. Angle should be determined on the amount of flow in the waterway and the MANUFACTURER's recommendation.
3. Turbidity barrier should be 10 to 20 percent longer than the straight line measurement.
4. Joints between panels should be kept to a minimum.
5. Barrier should extend to the top of bank. All ends should be secured firmly to the shoreline.
6. Where significant flow is anticipated, a heavy woven pervious filter fabric may be substituted.

D. Erosion Control and Excelsior Matting

1. Erosion control matting blankets shall be installed as shown on the Drawings and as approved in accordance with MANUFACTURER's instructions. The area to be covered shall be properly prepared before the blanket is applied. When the blanket is unrolled, the netting shall be on top and the fibers in contact with the soil over the entire area. The blankets shall be applied in the direction of water flow, and stapled. Blankets shall be placed a minimum of three rows (of 1.2 m) wide (total width approx. 3.6 m) and stapled together in accordance with MANUFACTURER's instructions. Side overlaps shall be 15-cm minimum. The staples shall be made of wire, 2-mm in diameter or greater, "U" shaped with legs 25-cm in length and a 4-cm crown. The staples shall be driven vertically into the ground, spaced approximately 60 cm apart, on each side, and one row in the center alternately spaced between each side. Upper and lower ends of the matting shall be buried to a depth of 10-cm in a trench. The bottom of the fold shall be 10-cm below the ground surface. Staple on both sides of fold. Where the matting must be cut or more than one roll length is required, turn down upper end of downstream roll into a trench to a depth of 10-cm. Overlap lower end of upstream roll 10-cm past edge of downstream roll and staple.
2. To ensure full contact with soil surface, roll matting with a roller weighing 150 kg per meter of width perpendicular to flow direction after placing matting, stapling and seeding and sodding. Thoroughly inspect channel after completion. Correct any areas where matting does not present a smooth surface in full contact with the soil below.

3.03 MAINTENANCE AND INSPECTIONS

A. Inspections

1. CONTRACTOR shall make a visual inspection of all sedimentation and erosion control devices (including turbidity barriers) once per week and promptly after every rainstorm. If such inspection reveals that additional measures are needed to prevent movement of sediment to areas outside the limits of construction,

CONTRACTOR shall promptly install additional devices as needed. Sediment controls in need of maintenance shall be repaired promptly.

2. CONTRACTOR shall keep a log of all inspections indicating the following:
 - a. Date and time of inspection
 - b. Inspector
 - c. Amount of rainfall
 - d. Erosion and sediment control devices inspected
 - e. Condition of sediment and erosion control devices
 - f. Repairs needed
 - g. Date repair is completed

B. Device Maintenance

1. Silt Fences
 - a. Remove accumulated sediment once it builds up to one-half of the height of the fabric.
 - b. Replace damaged fabric, or patch with a 60-cm minimum overlap.
 - c. Make other repairs as necessary to ensure that the fence is filtering all runoff directed to the fence.
2. Haybale Barriers
 - a. Remove accumulated sediment once it builds up to one-half of the height of the haybales.
 - b. Replace damaged haybales.
 - c. Make other repairs as necessary to ensure that the haybales are filtering all runoff directed to the barrier.
3. Turbidity Barriers
 - a. Turbidity barriers shall be inspected on a daily basis.
 - b. Replace damaged fabric, or patch with a 60-cm minimum overlap.
 - c. Make other repairs as necessary to ensure barriers are effectively maintaining turbidity levels outside of the barrier within limits specified in Section 01110.

3.04 TEMPORARY MULCHING

- A. Apply temporary mulch to areas where rough grading has been completed but final grading is not anticipated to begin within 21 days of the completion of rough grading. If construction activities are not planned to resume for three months or longer, the temporary sodding requirements shall be followed.
- B. Straw mulch shall be applied at rate of 2,000 kg/hectare and tackified with latex acrylic copolymer at a rate of 4 liters/100 m² diluted in a ratio of 30 parts water to 1 part latex acrylic copolymer mix.
- C. After temporary mulching, traffic should be kept to a minimum, except for designated temporary access roads.

3.05 REMOVAL AND FINAL CLEANUP

- A. Once the site has been fully stabilized against erosion, remove sediment control devices and all accumulated silt. Dispose of silt and waste materials in proper manner. Regrade all areas disturbed during this process and stabilize against erosion with surfacing materials as indicated on the Drawings or specified herein.

END OF SECTION

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SECTION 02273

GEOTEXTILE FABRIC

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install geotextile fabric complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Site preparation is included in Section 02100.
- B. Earthwork is included in Section 02200.
- C. High Density Polyethylene (HDPE) Liner is included in 02776.

1.03 SUBMITTALS

- A. The CONTRACTOR shall submit in accordance with Section 01300, the following:
 - 1. The manufacturer's background information and information on factory size, equipment, personnel, number of shifts per day and production capacity per shift.
 - 2. Product Data and Samples
 - a. A list of material properties and test results and attached mill certificates or affidavit signed by a legally authorized official from the company manufacturing the geotextile no less than 7 days in advance of delivery of material to the work site, in duplicate. The mill certificate or affidavit shall attest that the geotextile meets the chemical, physical and manufacturing requirements stated in these specifications.
 - b. If requested by the USAID COTR OR DESIGNATE, the CONTRACTOR shall provide to the USAID COTR OR DESIGNATE geotextile samples for testing to determine compliance with any or all the requirements in this specification. Samples shall be submitted within 5 days of the request. All samples provided shall be from the same production lot as will be supplied for the contract, and shall be the full manufactured width by at least 3 meters. Samples submitted for testing shall be identified by manufacturer's lot designation.
 - 3. The manufacturer's quality control program data and manual including description of laboratory facilities.
 - 4. A list of ten completed facilities where the geotextile was used in a similar manner including:
 - a) Name and purpose of facility, its location and date of installation.

- b) Name of Field Engineer, project manager, design engineer and installer.
 - c) Geotextile thickness and surface area.
 - d) Information on performance of the facility.
5. Shop drawings, including details of overlap and seaming of the geotextile, anchoring, connections and other construction details any variance or additional details that deviate from the Contract Drawings.
 6. The geotextile installation schedule.
 7. A manual that specifically defines manufacturer's installation instructions.
 8. The CONTRACTOR shall submit a copy of quality control certificates in conformance with Paragraph 2.03.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM D123 – Standard Terminology Relating to Textiles.
2. ASTM D3786 – Standard Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics – Diaphragm Bursting Strength Tester Method.
3. ASTM D4355 – Standard Test Method for UV Resistance of Geotextiles.
4. ASTM D4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
5. ASTM D4533 – Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
6. ASTM D4632 – Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
7. ASTM D4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile.
8. ASTM D4833 – Standard Test Method for Index Puncture and Resistance of Geomembranes and Related Products.
9. ASTM D4873 – Standard Guide for Identification, Storage and Handling of Geosynthetic Tolls and Samples.
10. ASTM D5261 – Standard Test Method for Mass Per Unit Area (Weight) of Fabric.

- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. The quality control and quality assurance consists of conformance testing of the material delivered to the site and field quality control during installation.
- B. Conformance testing requirements are included in Paragraph 2.04 below. The purpose of conformance testing is to assure that the supplied material conforms to this Section and to the manufacturer's quality control certificates.
- C. Field quality control requirements are included in Paragraph 3.03. The purpose of field quality control procedures is to assure that the geotextile material has been installed in accordance with this Section and manufacturer's recommendations.

1.06 DELIVERY, STORAGE AND HANDLING

- A. The geotextile shall be shipped, stored and handled in accordance with ASTM D4873 and as specified herein. Each roll shall be wrapped in an opaque and waterproof layer of plastic during shipment and storage. The plastic wrapping shall be placed around the geotextile roll in the manufacturing facility and shall not be removed until deployment. Each roll shall be labeled with the manufacturer's name, geotextile type, lot number, roll number, and roll dimensions (length, width, gross weight). Geotextile or plastic wrapping damaged as a result of delivery, storage, or handling shall be repaired or replaced, as directed at no additional cost to the USAID COTR OR DESIGNATE.
- B. No mechanical equipment or construction vehicles shall be driven directly on top of the geotextile. No hooks, tongs, or other sharp instruments shall be used for handling geotextile. Geotextile shall not be dragged along the ground. Any geotextile determined to be damaged as a result of poor handling shall be removed from the site and replaced, at no additional cost to the USAID COTR OR DESIGNATE, by additional geotextile meeting the requirements of this specification.
- C. The geotextile shall be stored in such a way that it is protected from prolonged exposure to ultraviolet radiation and temperatures in excess 60 degrees Celsius and shall be elevated from the ground (a minimum of 7.6 cm) to protect the geotextile from standing water, mud, dirt, dust and debris.

1.07 MATERIAL WARRANTY

- A. The geotextile manufacturer shall warrant the material against material degradation and manufacturing defects of the material and workmanship for a period of 20 years on a prorated basis from the date of Final Acceptance by USAID COTR OR DESIGNATE. The manufacturer shall replace, at no expense to the USAID COTR OR DESIGNATE, any defective geotextile material, including labor, within the warranty period. The manufacturer shall furnish a written warranty covering the requirements of this Section.

1.08 GUARANTEE

- A. The CONTRACTOR shall guarantee the geotextile against defects in installation and workmanship for the period of 2 years commencing with the date of final acceptance. The guarantee shall include the services of qualified service technicians and all materials and labor required for the repairs at no expense to the USAID COTR OR DESIGNATE.

PART 2 PRODUCTS

2.01 GENERAL

- A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration.

2.02 MATERIALS

A. Nonwoven Geotextile Fabric

1. The geotextile fabric shall be a nonwoven needle punched material consisting of filaments formed into a stable network in accordance with ASTM D123. Fibers used in the manufacture of the geotextile shall consist of long-chain synthetic polymer composed of at least 85 percent by weight of polyolefins, polyesters, or polyamides. Stabilizers and/or inhibitors shall be added to the base polymer if necessary to make the filaments resistant to deterioration caused by ultraviolet light and heat exposure. Reclaimed or recycled fibers or polymer shall not be added to the formulation. Geotextile shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including the edges. The edges of the geotextile shall be finished to prevent the outer fiber from pulling away from the geotextile. The geotextile shall be manufactured in a width not less than 3.66 meters and shall meet the physical requirements shown on Table 02273-1. The material shall also be non-biodegradable and nonreactive within a pH range of three to eleven.
2. All numerical values in Table 02273-1 represent minimum average roll values, i.e., any roll in a lot shall meet or exceed the minimum values.

TABLE 02273-1
NONWOVEN GEOTEXTILE FABRIC PROPERTIES

<u>Properties</u>	<u>Test Method</u>	<u>Unit</u>	<u>Min. Avg. Roll Values</u>
Grab Strength	ASTM D4632	N	1670 in any principle direction
Grab Elongation	ASTM D4632	percent	50 in any principle direction
Trapezoid Tear Strength	ASTM D4533	N	625 in any principle direction
Puncture Strength	ASTM D4833	N	1000
Mullen Burst Strength	ASTM D3786	kPa	5100
Permittivity	ASTM D4491	sec ⁻¹	0.54
Coef. of Permeability	ASTM D4491	cm/sec	0.3
Equivalent or Apparent Opening Size (AOS)	ASTM D4751	sieve	70 – 100
UV Resistance @ 500 hrs	ASTM D4355	% Strength Retained	50 for 500 hours
Seam Strength	ASTM D4632	N	1335

3. The values listed above are for the weaker principal direction.
4. Nonwoven geotextile fabric shall be manufactured by Mirafi; Trevira, Tenax, or by an approved manufacturer meeting the above physical properties.

B. Woven Fabric

1. Woven fabric shall be Mirafi HP370, or equal, as specified in Table 02273-2 unless otherwise approved by the USAID COTR OR DESIGNATE.

Table 02273-2
WOVEN GEOTEXTILE FABRIC PROPERTIES

<u>Properties</u>	<u>Test Method</u>	<u>Unit</u>	Min. Avg. Roll Values
Apparent Opening Size	ASTM D4751	mm	0.600
Permittivity	ASTM D4491	Sec ⁻¹	0.52
Strength @ Ultimate (MD)	ASTM D4595	kN/m	52.5
Strength @ Ultimate (CMD)	ASTM D4595	kN/m	39.4
Strength @ 2% Strain (MD)	ASTM D4595	kN/m	7.9
Strength @ 5% Strain (MD)	ASTM D4595	kN/m	21.9
Strength @ 10% Strain (MD)	ASTM D4595	kN/m	35

- C. Filter fabric shall be Mirafi, Type 140N; Dupont, Type PAR, Style 3401, or equal product by Amoco and shall conform to the following requirements:
1. Minimum grab strength of 534 N per ASTM D4632.
 2. Apparent Opening Size (AOS) to be equal to or greater than the U.S. Standard Sieve No. 70 (0.210 mm) per ASTM D4751.
 3. Percent open area not to exceed about 25 percent. The percent open area is defined as the ratio of the sum of 20 or more individual open areas (times 100) to the sum of the corresponding 20 or more individual total areas.
 4. Coefficient of permeability shall not be less than 10⁻² cm/sec.

2.03 QUALITY CONTROL DOCUMENTATION

- A. Prior to installation commencement of any geotextile material, provide to the USAID COTR OR DESIGNATE the following information certified by the manufacturer for the delivered geotextile.
1. Each roll delivered to the site shall have the following identification information:
 - a. Manufacturer's name
 - b. Product identification
 - c. Lot number
 - d. Thickness
 - e. Roll number

- f. Roll dimensions
2. Quality control certificates, signed by the manufacturer's quality assurance manager. Each certificate shall have roll identification number, sampling procedures, and frequency and test results. At a minimum the following test results shall be provided for every 9,300 m², or as otherwise noted, of manufactured geotextile in accordance with test requirements specified in Paragraph 2.02.
- a. Thickness
 - b. Mass per unit area
 - c. Trapezoid Tear Strength
 - d. Puncture Strength
 - e. Mullen Burst Strength
 - f. Grab Tensile Strength
 - g. Grab Elongation
 - h. Apparent Opening Size
 - i. UV Degradation
 - j. Seam Strength
 - k. Flow Rate

2.04 CONFORMANCE TESTING

- A. At the discretion of the USAID COTR OR DESIGNATE, conformance testing may be performed by an independent laboratory in accordance with Section 01410. USAID COTR OR DESIGNATE shall obtain samples from the delivered material, mark the machine direction, lot number and roll identification number. Two samples shall be taken per 9,300 m², or two samples per lot, whichever results in the greater number of conformance tests. This sampling frequency may be increased as deemed necessary by the USAID COTR OR DESIGNATE. The samples shall be taken across the entire roll width and shall not include the first 1 meter. The following conformance tests shall be conducted at the laboratory:
- 1. Mass per unit area (ASTM D5261)
 - 2. Mullen Burst Strength (ASTM D3786)
 - 3. Puncture Strength (ASTM D4833)
 - 4. Grab tensile (ASTM D4632)
 - 5. Water Flow Rate (ASTM D4491)

6. Apparent opening size (ASTM D4751)

- B. These conformance tests shall be performed in accordance with the test requirements included in Paragraph 2.02.
- C. All conformance test results shall be reviewed by the USAID COTR OR DESIGNATE and accepted or rejected, prior to the deployment of the geotextile. All test results shall meet, or exceed, the property values listed in Paragraph 2.02.
- D. If samples fail, the USAID COTR OR DESIGNATE may request that other samples be tested by the laboratory with the manufacturer's technical representative present during testing procedures. This retesting shall be paid for by the CONTRACTOR. The manufacturer may obtain additional samples from rolls immediately before and after the failing roll or as directed by the USAID COTR OR DESIGNATE and have them tested by the laboratory at his/her own expense. If these rolls pass then only the failing roll will be rejected. If they fail, then the entire lot will be rejected.

PART 3 EXECUTION

3.01 PREPARATION

A. General

The subgrade will be inspected by the USAID COTR OR DESIGNATE prior to installation of the geotextile for conformance with Section 02200. The surface on which the geotextile will be placed shall be prepared to a relatively smooth condition. The surface shall be free of obstructions, depressions, debris, erosion feature, or vegetation. No objects shall protrude more than 5.0 cm above the surface. Any irregularities shall be removed so as to insure continuous, intimate, contact of the geotextile with the entire surface. Erosion features such as rills, gullies, etc. must be graded out of the surface before geotextile placement.

3.02 INSTALLATION

A. General

At the time of installation, the geotextile will be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage. The prepared surfaces will require inspection and approval by the USAID COTR OR DESIGNATE prior to the placement of the geotextile.

B. Panel Placement

1. The geotextile shall be placed with the long dimension perpendicular to the slope of the revetment. The geotextile shall be laid smooth and free of tension, stress, folds, wrinkles or creases. The strips shall be placed to provide a minimum width of 30 cm of overlap for each joint along the slope. The placement shall be done in such a manner that the upstream geotextile overlies the downstream geotextile at each joint (i.e., shingle the upstream strip over the downstream strip). The placement procedures require that the length of the geotextile be slightly greater than the slope length. The CONTRACTOR shall adjust the

actual length of the geotextile used based on initial installation experience. Temporary pinning of the geotextile to help hold it in place until the overlying materials are placed will be allowed. The temporary pins shall be removed as the overlying materials are placed to relieve high tensile stress which may occur during placement of material on the geotextile. Other appropriate means to prevent movement such as sand bags and stone could also be used. Trimming of excess material shall be performed in such a manner that the geotextile shall not be damaged in any way. If a separate strip of geotextile is placed from the toe of the revetment to high water, a minimum of 1 meter overlap is required between this lower strip and the strip placed from high water to top of slope.

2. The geotextile shall be installed as shown on the Contract Drawings and in accordance with the manufacturer's recommendations and approved shop drawings.
3. No mechanical equipment or construction vehicles shall be driven directly on top of the geotextile.
4. Riprap shall be installed in accordance with Section 02370 and as shown on Contract Drawings.
5. Damage (including: tears, punctures, thinly stretched sections or defects not previously identified) to the geotextile occurring during the placement of riprap cover shall be repaired immediately at no additional expense to the USAID COTR OR DESIGNATE. Repairs shall be made by overlaying another layer of geotextile over the damaged area with 1 meter overlap all around. The patch shall be sewn to the fabric in accordance with Paragraph 3.02.B. Geotextile which cannot be repaired shall be replaced.
6. All geotextile fabric installation shall be completely covered at the end of each work day unless otherwise approved by the USAID COTR OR DESIGNATE. The geotextile fabric shall be covered within 7 days of installation at a minimum.
7. The geotextile shall be cut with approved tools.
8. Geotextile fabric must be anchored.
9. The geotextile shall be protected from damage during the placement of materials primarily by limiting the height of drop of materials to no greater than 30 cm.
10. The geotextile shall be protected at all times during construction from contamination by surface runoff and any geotextile so contaminated shall be removed and replaced with uncontaminated geotextile.

3.03 FIELD QUALITY CONTROL

- A. Prior to placement of the riprap, the geotextile installation and related work shall be inspected by the USAID COTR OR DESIGNATE. All work in the system therein being inspected shall be complete, clean and ready for use. All work shall meet the requirements as to line, grade, cleanliness and workmanship, as determined by the USAID COTR OR DESIGNATE.
- B. All discrepancies shall be noted and repaired at no additional cost to the USAID COTR OR DESIGNATE. Final acceptance of the system shall be contingent upon the approval of the USAID COTR OR DESIGNATE.

3.04 DISPOSAL OF WASTE MATERIAL

- A. Upon completion of installation, the CONTRACTOR shall remove and dispose in a proper manner approved by the USAID COTR OR DESIGNATE all trash, waste material and equipment used in connection with the performed work and shall leave the premises in a neat and acceptable condition.

END OF SECTION

SECTION 02370

RIP RAP

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and place rip rap and appurtenances as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Section 02200 Excavation, Backfill and Compaction.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Rip rap shall conform to the size types, as indicated on the Drawings, as follows:

Type A: 20-cm (8-inch) Average Size	
DIAMETER	PERCENTAGE PASSING
30-cm (12-inch)	95-100
20-cm (8-inch)	25-75
15-cm (6-inch)	0-10

Type B: 25-cm (10-inch) Average Size	
DIAMETER	PERCENTAGE PASSING
40-cm (16-inch)	95-100
25-cm (10-inch)	25-75
15-cm (6-inch)	0-5

- B. Rip rap used for channel and slope protection shall be sound, durable rock angular in shape and of suitable quality to insure permanence in the condition in which it is to be used. Control of gradation shall be by visible inspection. Rounded stones, boulders, sandstone, or similar soft stone or relatively thin slabs will not be acceptable. Material shall be free from overburden, spoil, shale and organic materials, and meet the USAID COTR OR DESIGNATE's approval.
- C. A gravel base shall be placed and graded to a depth of 15 cm to obtain a continuous uninterrupted bed of the required thickness within the required limits.
- D. Rip rap shall be placed and graded off in a manner to ensure that the larger rock fragments are uniformly distributed and that the smaller rock fragments serve to fill the spaces between the larger rock fragments in a manner that will result in a compact mass of stone of the specified thickness. Hand placing will be required only to the extent necessary to secure the results specified above.

- E. Rip rap shall have a minimum thickness as indicated on the Drawings with individual pieces at the surface having a maximum deviation of plus or minus 5 cm.
- F. Placing of rip rap in layers or by dumping into chutes or by similar methods to cause segregation will not be permitted.

2.02 CONFORMANCE TESTING

- A. Gradation analyses shall be performed at a frequency of one sample obtained for every 10,000 cubic meters delivered to the site from each source of stone or when any change in material is observed by the USAID COTR OR DESIGNATE to assure compliance with the Specifications.

PART 3 EXECUTION

3.01 WATER CONTROL

- A. Prior to commencing work on boulder, rock, and rip rap placement install water control measures as required to perform work in dry conditions. Water control measures shall include, but are not limited to, diversions, sheet pile, sumps with pumps, or other means necessary to maintain the level of groundwater below subgrade elevation and to divert surface water away from the work area. The CONTRACTOR is responsible for investigating and familiarizing himself with respect to all site conditions that may affect the work, including surface water, level of groundwater, and time of year the work is to be done.

3.02 INSTALLATION

- A. Rip rap shall be placed to the limits and grades shown on the Drawings.
- B. Channel slopes, bottoms, or other areas that are to be protected with rip rap shall be free of brush, trees, stumps, and other objectionable material and be graded to a smooth compacted surface. CONTRACTOR shall excavate areas to receive rip rap to the subgrade for granular bedding. The subgrade for bedding materials shall be stable. If unsuitable materials are encountered, they shall be removed and replaced in accordance with Section 02200 of the specifications. Unsuitable materials shall be disposed of from the site by CONTRACTOR at his expense. After an acceptable subgrade for granular bedding material is established, the bedding shall be immediately placed and leveled to the subgrade elevation. Immediately following this, the rip rap shall be placed. If bedding material is disturbed for any reason, it shall be replaced and graded at CONTRACTOR's expense. In-place bedding materials shall not be contaminated with soils, debris, or vegetation before the rip rap is placed. If contaminated, the bedding material shall be removed and replaced at CONTRACTOR's expense.

3.03 PLACEMENT

- A. Following acceptable placement of granular bedding, rip rap placement shall commence as follows:
1. Machine Placed Rip rap: Rip rap shall be placed on the prepared slope or channel bottom areas in a manner that will produce a reasonably well-graded mass of stone with the minimum practicable percentage of voids. Rip rap shall be machine placed, unless otherwise stipulated in the Drawings or specifications.
 - a. When rip rap is placed on slopes, placement shall commence at the bottom of the slopes working up the slope. Place the rip rap in a stepped fashion with the bottom of the uphill rip rap below the top of the downhill rip rap by half of the height of the rip rap minimum.
 - b. The entire mass of rip rap shall be placed on either channel slopes or bottoms so as to be in conformance with the required gradation mixtures and to lines, grades, and thickness shown on the Drawings. Rip rap shall be placed to its full course thickness at one operation and in such a manner as to avoid displacing the underlying bedding material. Placing of rip rap in layers, or by dumping into chutes, or by similar methods shall not be permitted.
 - c. All material going into rip rap protection for channel slopes or bottoms shall be so placed and distributed that there will be no large accumulations of either the larger or smaller sizes of stone. Some hand placement may be required to achieve this distribution.
 - d. It is the intent of these specifications to produce a fairly compact rip rap protection in which all sizes of material are placed in their proper proportions. Unless otherwise authorized by the USAID COTR OR DESIGNATE, the rip rap protection shall be placed in conjunction with the construction of embankments or channel bottoms with only sufficient delay in construction of the rip rap protection, as may be necessary, to allow for proper construction of the portion of the embankment and channel bottom that is to be protected. CONTRACTOR shall maintain the rip rap protection until accepted. Any material displaced for any reason shall be replaced to the lines and grades shown on the Drawings at no additional cost to Owner. If the bedding materials are removed or disturbed, such material shall be replaced prior to replacing the displaced rip rap.
 2. Hand Placed Rip rap: Hand placed rip rap shall be performed during machine placement of rip rap and shall conform to all the requirements of PART 2 above. Hand placed rip rap shall also be required when the depth of rip rap is less than two times the nominal stone size, or when required by the Drawings or specifications.
 - a. After the rip rap has been placed, hand placing or rearranging of individual stones by mechanical equipment shall be required to the extent necessary to

secure a flat uniform surface and the specified depth of rip rap, to the lines and grades as shown on the Drawings.

3. Rejection of Work and Materials: The USAID COTR OR DESIGNATE shall reject placed rip rap that does not conform to this Section and CONTRACTOR shall immediately remove and re-lay the rip rap to conform to this Section.
 - a. Rip rap shall be rejected, which is either delivered to the job site or placed, that does not conform to this Section. Rejected rip rap shall be removed from the project site by CONTRACTOR at his expense.

END OF SECTION

SECTION 02505

CRUSHED STONE PAVING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals required to construct access roads and laydown surfacing as shown on the Drawings.
- B. The CONTRACTOR shall maintain roads and surfaced areas under this Contract until project final completion and shall promptly refill and grade areas which have settled or are otherwise unsatisfactory for traffic.

1.02 RELATED WORK NOT INCLUDED

- A. Testing and testing laboratory services are included in Section 01410.
- B. Earthwork is included in Section 02200.

1.03 SUBMITTALS

- A. The CONTRACTOR shall submit to the USAID COTR OR DESIGNATE in accordance with Section 01300 the results of recent gradation and modified Proctor moisture-density test performed on the proposed crushed stone paving material.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - 2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

PART 2 PRODUCTS

2.01 SUBGRADE MATERIAL

- A. Subgrade in cut areas shall consist of firm, hard natural soils and shall be proofrolled as described in Paragraph 3.02. Subgrade in fill areas shall meet the fill material requirements as defined in Section 02200 and compacted to at least 100 percent of its standard Proctor (ASTM D698) maximum dry density.

2.02 CRUSHED STONE

- A. Crushed stone paving material shall be compacted to at least 98 percent of its modified Proctor (ASTM D1557) maximum dry density and shall meet the following gradation requirements:

<u>Sieve Size</u>	<u>Percent Passing</u>
1.5" (38.1 mm)	100%
1" (25.4 mm)	75% to 97%
0.5" (12.7 mm)	55% to 80%
No. 4 (4.75 mm)	35% to 55%
No. 10 (2.00 mm)	25% to 45%
No. 40 (0.425 mm)	14% to 30%
No. 200 (0.075 mm)	4% to 12%

PART 3 EXECUTION

3.01 GENERAL

- A. Materials for all access and service roads shall be delivered, placed, and compacted in accordance with the contract specifications and drawings.
- B. The CONTRACTOR shall perform all general unclassified excavation, rough or overall grading, borrow and fill, to the subgrades of the road, road shoulders and slopes to match the existing grades or the proposed grades as shown on the drawings.
- C. Finished excavation and grading shall be uniformly smooth, well compacted, and free from irregular surface changes. The degree of finish shall be that obtainable from either blade-grader or scraper operations. The finished surface shall not be more than 3 cm above or below the design grade.

3.02 INSTALLATION

- A. Prior to placing Select Fill in fill areas or Crushed Stone paving in cut areas, the exposed natural soil subgrade shall be proofrolled. Proofrolling shall be performed with at least four complete coverages of the rear wheels of a fully-loaded CAT D300D truck or equivalent or as directed by the USAID COTR OR DESIGNATE. Soft, wet, organic, or other unsuitable materials or conditions identified during proofrolling shall be undercut by at least 30 cm and backfilled with fill meeting the requirements of Section 02200 as directed by the USAID COTR OR DESIGNATE.
- B. Fill shall be placed in layers in accordance with Section 02200 and compacted to at least 100 percent of its standard Proctor (ASTM D698) maximum dry density.
- C. If indicated, place geotextile fabric at base of crushed stone paving as indicated on the Drawings and Specifications.

- D. Crushed stone paving shall be placed over the prepared subgrade where shown on the Contract Drawings. The first lift of crushed stone, measured before compaction, shall be at least 20 cm thick and less than 25 cm thick. The crushed stone shall be spread with track mounted equipment. Subsequent lifts of crushed stone shall have a maximum loose lift thickness of 15 cm. Each lift of crushed stone shall be compacted to at least 98% of its modified Proctor (ASTM D1557) maximum dry density.

END OF SECTION

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SECTION 02605

PRECAST CONCRETE MANHOLES AND STRUCTURES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required to install precast concrete manholes, structures, frames and covers, access hatches, manhole rungs, dampproofing, ladders and appurtenances as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Earthwork is included in Section 02200.
- B. Cast-In-Place Concrete is included in Section 03300.

1.03 SUBMITTALS

- A. Shop drawings in accordance with Section 01300 showing details of construction, reinforcing, joints, pipe connection to manhole, manhole rungs, manhole frames and covers. Submittals shall include the following:
 - 1. Base sections, riser sections, eccentric and concentric conical top section with notarized certificate indicating compliance with ASTM C478.
 - 2. Pipe connection to manhole.
 - 3. Manhole rungs or ladders, including method of installation and notarized certificate indicating compliance with pull-out resistance test specified herein.
 - 4. Manhole frame and cover with notarized certificate indicating compliance with ASTM A48, Class 30.
 - 5. Method of repair for minor damage to precast concrete sections.
- B. Prior to fabrication of box culvert sections, submit for approval, with shop drawings, a schedule of section lengths for this project. All precast sections furnished under this Contract shall be fabricated in full accordance with the approved shop drawings.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM A48 - Specification for Gray Iron Castings.
 - 2. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

3. ASTM C32 - Specification for Sewer and Manhole Brick (Made from Clay or Shale).
 4. ASTM C33 - Specification for Concrete Aggregates.
 5. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)
 6. ASTM C150 - Standard Specification for Portland Cement
 7. ASTM C207 - Specification for Hydrated Lime for Masonry Purposes
 8. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
 9. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections
 10. ASTM D4101 - Specification for Propylene Plastic Injection and Extrusion Materials.
- B. American Concrete Institute (ACI)
1. ACI 318 - Building Code Requirements for Reinforced Concrete
 2. ACI 350R - Concrete Sanitary Engineering Structures
- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. All material shall be new and unused.
- B. Materials' quality, manufacturing process and finished sections are subject to inspection and approval by USAID COTR OR DESIGNATE. Inspection may be made at place of manufacture, at work site following delivery, or both.
- C. Materials will be examined for compliance with ASTM specifications, these Specifications and approved manufacturer's drawings. Additional inspection criteria shall include: appearance, dimensions(s), blisters, cracks and soundness.
- D. Materials shall be rejected for failure to meet any Specification requirement. Rejection may occur at place of manufacture, at work site, or following installation. Mark for identification rejected materials and remove from work site immediately. Rejected materials shall be replaced at no cost to USAID.
- E. Repair minor damage to precast concrete sections by approved method, if repair is authorized by USAID COTR OR DESIGNATE.

PART 2 PRODUCTS

2.01 GENERAL

- A. Reference to a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.
- B. Like items of materials/equipment shall be the end products of one manufacturer in order to provide standardization for appearance, operation, maintenance, spare parts and manufacturer's service.
- C. Provide lifting lugs or holes in each precast section for proper handling.

2.02 PRECAST CONCRETE MANHOLE SECTIONS

- A. Precast concrete base sections, riser sections, transition top sections, flat slab tops and grade rings shall conform to ASTM C478 and meet the following requirements:
 - 1. Bottom slab thickness shall equal the riser wall thickness or flat slab top thickness, whichever is greater.
 - 2. Top section shall be concentric cone where cover over pipe exceeds 1.2 meters. Top section shall be a flat slab where cover over top of pipe is 1.2 meters or less. Top section shall be a plastic lined flat slab where manhole riser sections are to be plastic lined.
 - 3. Base, riser and transition top sections shall have tongue and groove joints.
 - 4. Sections shall be cured by an approved method.
 - 5. Precast concrete sections shall be shipped after concrete has attained 20.7 MPa compressive strength.
 - 6. Design precast concrete base, riser, transition top, flat slab top and grade ring for a minimum H-20 loading plus earth load. Calculate earth load with a unit weight of 20.4 kN/m³.
 - 7. Mark date of manufacture, name and trademark of manufacturer on the inside of each precast section.
 - 8. Construct and install precast concrete base as shown on the Drawings.
 - 9. Provide integrally cast knock-out panels in precast concrete manhole sections at locations, and with sizes shown on Drawings. Knock-out panels shall have no steel reinforcing.

2.03 MANHOLE FRAME AND COVER

- A. Manhole frames and covers shall be of good quality, strong, tough, even grained cast iron, smooth, free from scale, lumps, blisters, sand holes and defects of any kind which

render them unfit for the service for which they are intended. Manhole covers and frame seats shall be machined to a true surface. Castings shall be thoroughly cleaned and subject to hammer inspection. Cast iron shall conform to ASTM A48, Class 30.

- B. Manhole covers shall have a diamond pattern, pickholes and the word LEACHATE cast in 7.6 cm letters. Manhole frame and covers shall be Neenah Foundry or approved equal.

2.04 JOINTING PRECAST MANHOLE SECTIONS

- A. Seal tongue and groove joints of precast manhole sections with either rubber "O"-ring gasket or preformed flexible joint sealant. "O"-ring gasket shall conform to ASTM C443. Preformed flexible joint sealant shall be Kent Seal No. 2 as manufactured by Hamilton-Kent; Ram-Nek as manufactured by K.T. Snyder Company or approved equal.
- B. Completed joint shall withstand 103 kPa internal water pressure without leakage or displacement of gasket or sealant.

2.05 MANHOLE RUNGS

- A. Manhole rungs shall be either of the following types:
 1. Cast aluminum alloy 6061-T6, drop front design, 0.4 m wide with an abrasive step surface conforming to OSHA requirements.
 2. Steel reinforced, copolymer polypropylene, 0.36 m wide, M.A. Industries Inc, PF Series or approved equal. Copolymer polypropylene shall conform to ASTM D4101 Classification PP200 B33450 Z02. Steel reinforcing shall be 1.25 cm diameter, conforming to ASTM A615, Grade 60 and shall be continuous throughout rung.

2.06 PIPE CONNECTIONS TO MANHOLE

- A. Connect pipe to manhole in the following ways:
 1. Grout in place - Precast manhole section shall have a formed, tapered circular opening larger than the pipe outside diameter. Grout shall be non-shrink and waterproof equal to Hallemite, Waterplug or Embeco. Plastic pipe shall have a waterstop gasket secured to pipe with a stainless steel clamp.
 2. Flexible sleeve - Integrally cast sleeve in precast manhole section or install sleeve in a formed or cored opening. Fasten pipe in sleeve with stainless steel clamp(s). Coat stainless steel clamp(s) with bituminous material to protect from corrosion. Flexible sleeve shall be Lock Joint Flexible Manhole Sleeve; Kor-N-Seal connector; PSX Press-Seal Gasket or approved equal.
 3. Compression gasket - Integrally cast compression gasket in precast manhole section. Insert pipe into compression gasket. Compression gasket shall be A-Lok, or approved equal.

2.07 COATING AND DAMPPROOFING

- A. Dampproofing shall be Hydrocide 648 by Sonneborn Building Products; Dehydratine 4 by A.C. Horn Inc; RIW Marine Liquid by Toch Brothers, or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Manhole Installation

1. Manhole shall be constructed to the dimensions shown on the Drawings and as specified in these Specifications. Protect all work against flooding and flotation.
2. The bases of manholes shall be placed on a bed of 30 cm crushed stone as shown on the Drawings. The bases shall be set at a grade to assure that a maximum of 15 cm thickness of a mortar bed will bring the manhole frame and cover to final grade. Cast-in-place bases, where permitted by the USAID COTR OR DESIGNATE, shall be constructed in accordance with the details shown on the Drawings and the requirements of Division 3. The 28-day compressive strength of concrete shall not be less than 34.5 MPa.
3. Set precast concrete barrel sections plumb with a 0.65 cm maximum out of plumb tolerance allowed. Seal joints of precast barrel sections with either a rubber "O" ring set in a recess or preformed flexible joint sealant in sufficient quantity to fill 75 percent of the joint cavity. Fill the outside and inside joint with non-shrink mortar and finished flush with the adjoining surfaces. Caulk the inside of any leaking barrel section joint with lead wool or non-shrink grout to the satisfaction of the USAID COTR OR DESIGNATE. The CONTRACTOR shall install the precast sections in a manner that will result in a watertight joint.
4. Allow joints to set for 14 hours before backfilling unless a shorter period is specifically approved by the USAID COTR OR DESIGNATE.
5. Plug holes in the concrete barrel sections required for handling with a non-shrinking grout or non-shrinking grout in combination with concrete plugs. Finish flush on the inside.
6. Cut holes in precast sections to accommodate pipes prior to setting manhole sections in place to prevent jarring which may loosen the mortar joints.
7. Backfill carefully and evenly around manhole sections.

B. Manhole Pipe Connections

1. Construct manhole pipe connections, including pipe stubs, as specified above. Close or seal pipe stubs for future connections with a gasketed watertight plug.

C. Manhole Rung Installation

1. Steel reinforced polypropylene plastic manhole rungs shall be driven into tapered holes in the precast riser and cone sections during the manufacture of the sections. Holes for rungs shall be preformed during the casting of the section and shall not be drilled out after casting. The preformed holes shall be a minimum of 8.9 cm deep and shall taper from 2.9 cm to 3.5 cm diameter.
2. Pull-out resistance test
 - a. All manhole rung installation methods shall withstand a pull-out resistance test of 6.7 kN.

D. Setting Manhole Frame and Cover

1. Manhole covers and frames shall be set in a full mortar bed, a minimum of 15 cm, shall be utilized to assure frame and cover are set to the existing grade. If full-width paving is the permanent paving, the manhole frame and cover shall be reset to final grade prior to placement of permanent paving.

E. Dampproofing

1. Paint outer surfaces of precast and cast-in-place manholes and precast structures with two coats of bituminous dampproofing at the rate of 0.736 to 1.473 m²/L, as directed by the USAID COTR OR DESIGNATE and in accordance with manufacturer's instructions.

3.02 CLEANING

- A. Thoroughly clean all new manholes of all silt, debris and foreign matter of any kind, prior to final inspections.

END OF SECTION

SECTION 02610

CONCRETE MASONRY UNIT CONTAINMENT WALL

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The CONTRACTOR may elect to modify the proposed concrete masonry elements based on the CONTRACTOR's means and method. Any revised approaches should meet the requirements of Paragraph 1.04.
- B. Design, furnish all labor, materials, equipment and incidentals necessary to install the concrete masonry unit containment wall as shown on the drawings, including wall foundation and appurtenant materials.

1.02 RELATED WORK

- A. Earthwork is included in Section 02200.

1.03 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM C39 – Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - 2. ASTM C94 - Standard Specification for Ready Mixed Concrete
 - 3. ASTM C140-75 - Sampling and Testing Concrete Masonry Units
 - 4. ASTM C1372 - Standard Specification for Dry-Cast Segmental Retaining Wall Units
- B. American Concrete Institute (ACI)
 - 1. ACI 301-99 - Specification for Structural Concrete
- C. National Concrete Masonry Association (NCMA)
 - 1. Design Manual for Segmental Retaining Walls, Second Edition

1.04 SUBMITTALS

- A. The CONTRACTOR may modify the design, configuration, and construction sequence of the concrete masonry unit containment wall after approval by the USAID COTR OR DESIGNATE. Submit, in accordance with Section 01300, design calculations and Shop Drawings for the CONTRACTOR-designed concrete masonry unit containment wall stamped by a Professional Engineer. Submittals shall indicate the following, as a minimum:
 - 1. Design calculation package shall meet the minimum requirements under Paragraph 1.06 and shall include:

- a. Loads on the concrete masonry unit containment wall during all stages of construction and backfilling. Material, equipment and surcharge loads are anticipated to act on the concrete masonry unit containment wall.
 - b. Design of the wall and all interlocking connections for all stages of construction demonstrating that the wall will be stable against all loads acting on it.
 - c. Settlement analysis for the designed concrete masonry unit containment wall.
2. Shop Drawings shall include:
- a. Show the methods and overall sequence of construction including (i) initial construction, (ii) deconstruction of concrete masonry blocks at the end of the first year of thermal treatment, and (iii) at completion of the second year of thermal treatment.
 - b. Provide an overall plan layout of the pile structure indicating interior and exterior wall dimensions and material properties.
 - c. Provide cross-sections showing the layers and block dimensions along the height of the wall.
 - d. Details, layout, arrangement, equipment requirements, and method of construction of the concrete masonry unit containment wall.
- B. Submit quality control measures as required to ensure that the performance of the concrete masonry unit containment wall is consistent with the approved shop drawings and the requirements herein.
- C. Submit CONTRACTOR's and DESIGN ENGINEER's qualifications as described herein.
- D. At least one copy of the design shall be maintained at the job site during the construction that includes a plan indicating sizes and configurations of the materials to be used in the concrete masonry unit containment wall, and the identity of the Professional Engineer who approved the design.
- E. Submit samples of precast concrete blocks including texture style, edge treatment, and MPa rating of concrete.
- F. Manufacturer of concrete blocks shall submit representative cylinder tests from blocks to wall system manufacturer, to document that quality control procedures are in place. A minimum of two copies shall also be submitted to USAID COTR OR DESIGNATE at the same time. A minimum of two copies of findings from system manufacturer shall also be forwarded to USAID COTR OR DESIGNATE.
- G. Submit to the USAID COTR OR DESIGNATE, written certification from the manufacturer, or his/her representative, that the concrete masonry unit containment wall has been properly installed in accordance with the manufacturer's recommendations.

1.05 DELIVERY, STORAGE AND HANDLING

- A. CONTRACTOR shall check the materials upon delivery to assure that proper material has been received.
- B. CONTRACTOR shall prevent excessive mud, wet cement, epoxy, and like material which may affix themselves, from coming into contact with the materials.
- C. CONTRACTOR shall protect the materials from damage. Damaged material shall not be incorporated into the containment wall system.

1.06 DESIGN CRITERIA

- A. The concrete masonry unit containment wall shall be designed to meet the minimum bearing capacity, base sliding, interface sliding, and overturning factors of safety during all phases of construction. The minimum factors of safety are 3.0 for bearing capacity, 1.5 for basal sliding, 1.5 for interface sliding, and 2.0 for overturning.
- B. Based on the boring logs, the CONTRACTOR shall develop parameters for the foundation soils to be used in design.
- C. Loading on the containment wall due to the equipment surcharge shall be assumed to act along the entire height of the wall.
- D. The minimum active earth pressure due to the excavated soil and sediment backfill acting on the containment wall shall be assumed to be a triangular distribution calculated using the Mohr-Coulomb active earth pressure theory and assuming the internal angle of friction is equal to 28 degrees for the compacted soil and sediment backfill.
- E. Contributions from passive earth pressure at the exterior toe of the containment wall shall be neglected.
- F. The minimum unit weight of the concrete masonry unit containment wall shall be 22 kN/m³.
- G. The groundwater level should be assumed to be at ground surface.
- H. The concrete masonry units shall be staggered such that the joints occur over the middle of the unit below.
- I. The minimum interior dimensions of the concrete masonry unit containment wall shall be 70.6m x 104.9m.
- J. The concrete masonry unit containment wall shall be able to contain a minimum height of 7.9m of backfill material and final cap.

1.07 QUALITY ASSURANCE

- A. Regulations: Perform all work in accordance with current applicable regulations and codes of all national and local agencies.

- B. The CONTRACTOR shall have at least five (5) years experience with compatible work to the work, shown and specified, employing labor and supervisory personnel who are similarly experienced in this type of work.
- C. Design of the concrete masonry unit containment wall shall be performed by a Professional Engineer with at least five (5) years experience in design of similar retaining walls and shall have completed not less than five (5) successful retaining wall projects of equal type, size, and complexity to that required for the work and deemed acceptable to the USAID COTR OR DESIGNATE.
- D. Wet Concrete Samples:
 - 1. Obtain wet concrete samples at a minimum frequency one (1) sample per day during casting of the blocks.
 - 2. Each concrete sample shall be of sufficient volume to produce a minimum of three (3) 15-cm diameter cylinder molds. The molds shall be prepared within 60 minutes of collecting wet concrete samples from the mixing equipment.
 - 3. Form, preserve, and cure all concrete samples in accordance with ASTM Specification C 39. Protect concrete samples from freezing and extreme weathers conditions at all times.
 - 4. The cylinder samples shall be tested for unconfined compressive strength in a testing laboratory. Payment for the laboratory testing will be made by the CONTRACTOR. One (1) sample shall be tested at 7 days. A second sample shall be tested at 28 days.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Each concrete block shall be constructed in a set of forms. Blocks shall each have a top and bottom integrated modular interlocking tongue and groove system to fix blocks together by gravity as blocks are stacked vertically.
- B. The containment wall shall be a commercial grade installation, all blocks placed with joint patterns in staggered rows. Length and height of wall shall be constructed to conform to the minimum dimensions as shown on the Drawings.
- C. The concrete masonry units shall have a minimum 28-day compressive strength of 20.7 MPa at the time of delivery to the site. The concrete shall have maximum absorption rate of 5 percent to ensure adequate freeze/thaw protection.
- D. Exterior dimensions shall not vary by more than 1.9 cm. The units are required to have a minimum face area of 0.88 m².
- E. Crushed stone leveling pad material shall be as specified in Section 02200.
- F. Excavated soil and sediment backfill material shall be compacted as specified in Section 02200.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Commence construction of the concrete masonry unit containment wall only after the shop drawings and design calculations have been reviewed and accepted by the USAID COTR OR DESIGNATE.
- B. Construct concrete masonry unit containment wall in accordance with the approved shop drawings and applicable permits.
- C. Methods of construction shall be such that to ensure the safety of the work, CONTRACTOR'S employees, USAID COTR OR DESIGNATE, the public and adjacent property and improvements, whether public or private.

3.02 SUBGRADE PREPARATION

- A. Subgrade under the wall shall be prepared in accordance with Section 02200.
- B. If subgrade is judged to be weak, disturbed or otherwise unsuitable by the USAID COTR OR DESIGNATE, the CONTRACTOR shall remove the unsuitable material and replace it with structural fill as specified in Section 02200.
- C. Over excavated areas shall be filled with compacted structural fill as specified in Section 02200.
- D. The leveling pad shall be 30 cm in thickness and compacted to not less than 95% of maximum dry density as determined by ASTM D1557.

3.03 WALL INSTALLATION

- A. Install drainage system including backfill materials as shown on the Drawings.
- B. Install subgrade materials including leveling and compacting base structural fill material and install precast concrete blocks in accordance with manufacturer's instructions.
- C. Lay the first course of standard concrete blocks directly on the prepared leveling base. Align and level each block uniformly. Concrete blocks shall be spaced in accordance with manufacturer's instructions to provide for drainage.
- D. Use standard concrete blocks to lay the second course by fitting the slot onto the key of the course below. Sweep clean the top of each concrete prior to laying the next course.
- E. Stagger the standard concrete block units so the joints occur over the middle of the block below. This creates a "running bond" pattern which shall be maintained for the remaining courses of the entire wall. Half units may be used to complete the running bond pattern and to finish off the ends of the wall.
- F. Soil and sediment backfill shall be placed in 30 cm lifts and compacted to not less than 90% of maximum dry density in accordance with ASTM D1557.
- G. Backfill shall be placed from the wall outward.

- H. Tracked construction equipment shall be minimally operated directly upon the backfill. Turning of tracked vehicles shall be kept at a minimum to prevent tracks from displacing the backfill and damaging the wall.

3.05 FINISHING WALL

- A. The top of the wall shall be capped with a 15 cm layer of crushed stone.
- B. Finish grading of the cap to direct surface runoff to the outside of the pile structure.

3.06 MANUFACTURER'S REPRESENTATIVE

- A. A representative of the block manufacturer shall be present while subgrade is being prepared and wall is being installed.
- B. The manufacturer's representative(s) shall certify in writing that the wall has been properly installed in accordance with the manufacturer's recommendations.

3.07 REMOVAL OF CONCRETE MASONRY UNIT CONTAINMENT WALL

- A. The concrete masonry unit containment wall shall be carefully deconstructed and removed from the site. The concrete blocks shall become the property of the CONTRACTOR.
- B. Removal shall begin at and progress from the top of the concrete masonry unit containment wall. Individual concrete block units shall be removed in a sequence to minimize the possible failure or remaining sections.

3.08 RESTORATION

- A. Restore the work area disturbed by the construction activities and stockpile structure placement to the original condition.

END OF SECTION

SECTION 02612
REINFORCED CONCRETE DRAIN PIPE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals necessary and install and test reinforced concrete pipe for drains complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Testing and cleaning of pipe lines is included in Section 01410.
- B. Earthwork is included in Section 02200.
- C. Concrete is included in Division 3.

1.03 SUBMITTALS

- A. Within 30 days of the Effective Date of the Agreement submit the name of the pipe and fitting supplier and a list of materials to be furnished.
- B. Submit, in accordance with Section 01300, shop drawings showing layout and details of reinforcement, joint, method of manufacture and installation of pipe, specials and fittings, and a schedule of pipe lengths by diameter for the entire job.
- C. Submit with the shop drawings certification from the manufacturer that the fine and course aggregates used in manufacture of the concrete pipe comply with the requirements of Paragraph 2.01C.
- D. Prior to each shipment of pipe, submit the manufacturer's certification that the pipe for this Contract conforms to the ASTM Standards specified herein.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM C33 - Standard Specification for Concrete Aggregates.
 - 2. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
 - 3. ASTM C150 - Standard Specification for Portland Cement.
 - 4. ASTM C361 - Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.

5. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. The manufacturer shall perform the acceptance tests specified in ASTM C76, Paragraph 5.1.2.
- B. Inspection of the pipe will be made by the USAID COTR OR DESIGNATE after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the requirements specified herein, even though pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall immediately be removed from the job.

PART 2 PRODUCTS

2.01 REINFORCED CONCRETE PIPE

- A. The CONTRACTOR shall furnish piping and appurtenances for sewers shall be of the type and material specified. All pipe, fittings, jointing, materials, grates, manhole frames and covers, and other appurtenances shall be new material to be included in the work; and if not specifically described in these specifications, shall be of the best quality and entirely suitable for the service intended. The USAID COTR OR DESIGNATE, prior to installation, shall approve all such material.
- B. The CONTRACTOR shall furnish reinforced concrete pipe for the construction of the storm drainage system shall be manufactured in accordance with ASTM C76. The reinforced concrete pipe shall meet the design requirements for Class III pipe as specified in ASTM C76. Location and size of pipe is as shown on the drawings.
- C. The CONTRACTOR shall furnish reinforced concrete pipe sealed by the use of round rubber gaskets. The rubber gaskets used shall meet the requirements as specified in ASTM C443.
- D. Reinforced Concrete Pipe: Conform to ASTM C76 and the following additional requirements:
1. Cement shall be Type II conforming to ASTM C150 or Type I/II conforming to AASHTO M85.
 2. The minimum Portland cement content shall be 470 lbs. per cubic yard.
 3. The water/cement ratio shall not exceed 0.53.
 4. All pipe reinforcement shall consist of ASTM A82, A496, A185, A497 or A615.

5. The CONTRACTOR shall provide the USAID COTR OR DESIGNATE with a Certificate of Compliance from the pipe manufacturer that the pipe and concrete mix conform in all respects to these specifications and other non-conflicting requirements of the reference ASTM Specifications.
- E. Concrete Pipe Joints: Joints shall be T & G rubber gasketed type and furnished by the pipe manufacturer. Joints shall conform to ASTM C443, including performance requirements for joints. Pipe manufacturer shall furnish lubricants for joints.
- F. Cement Mortar: Use mix of 1 part cement and 2 parts of clean, well-graded sand of which 100% will pass a one-eighth inch sieve or, optionally, premixed mortar conforming to ASTM C387, Type N may be used.

PART 3 EXECUTION

3.01 INSTALLATION

- A. The CONTRACTOR shall protect the pipe during storage and handling against impact shocks, and free fall. Pipe shall be kept clean at all times and no pipe shall be used that does not conform fully to standards or specifications.
- B. The CONTRACTOR shall lay each pipe section in strict conformance with the line and grade as shown on the construction plans. The laying of pipe in finished trenches shall commence at the lowest point with the bell end laid upgrade.
- C. The CONTRACTOR shall provide and maintain on the job site at all times, appropriate and well maintained equipment for checking the grade of the pipe being laid.
- D. The CONTRACTOR may use any of the several type laser beam devices is provided it is in good repair and calibration and a level and level rod is used to check for grade at catch basins, manholes and outfalls. Use of levels and/or transits alone is discouraged and generally will not be permitted.
- E. The CONTRACTOR shall, prior to, but not more than 24 hours prior to installing the pipe, place the rubber gasket on the tongue to the pipe, in accordance with the manufacturer's recommendations. The tongue end shall be protected at all times from the sun, blowing dust, or other deleterious agents. Gaskets shall be inspected before installation of the pipe and any loose or improperly affixed gaskets shall be removed and replaced.
- F. The CONTRACTOR shall set the pipe firmly according to the lines and grade; and preparatory to making joints for concrete pipe, all surfaces of the portion of the pipe to be jointed shall be thoroughly cleaned. The pipe shall be laid with the groove upstream. A shallow excavation shall be made underneath the pipe at the joint.
- G. The CONTRACTOR shall coat the entire interior of the groove, or bell, of the pipe with an approved vegetable soap lubricant immediately prior to installation. For o-ring gasket pipe, the spigot of the adjoining pipe, including the o-ring gasket recess, shall also be lubricated. Lubricate the o-ring gasket and install in the gasket recess of the spigot.

Equalize the gasket around the entire spigot. For profile gasket pipe, lubricate only the interior bell surface of the pipe and install the gasket on the spigot end according to the manufacturer's instructions. Self-lubricated, or internally lubricated, gaskets shall not be used. The groove and spigot ends shall be cleaned prior to application of the lubricant. The pipe shall then be aligned with the previously installed pipe and the joint pulled together. The joint shall be pulled by the use of interior or exterior pull jacks or winches, anchored by suitable means. The choice of methods and type of equipment will depend on trench conditions, type and size of pipe, and its ability to properly seat the gasket. If, while making the joint, the gasket becomes loose and can be seen through the exterior joint recess, when the joint is pulled up to within one inch of closure, the pipe shall be removed and the joint remade.

3.02 WATER CONTROL

- A. The CONTRACTOR shall control water so that it does not interfere with the installation of piping and ability to achieve compaction. Dewatering shall be performed in accordance with SECTION 02140.

END OF SECTION

SECTION 02776

HIGH DENSITY POLYETHYLENE (HDPE) LINER

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals required and install Textured High Density Polyethylene (HDPE) liner at the Temporary Storage Area and at the Temporary Storage Pad as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Earthwork is included in Section 02200.
- B. Geotextile Fabric is included in Section 02273.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, prior to furnishing and installation of the HDPE liner for the temporary storage pads, a HDPE Liner Work Plan that contains the following:
 - 1. Samples of HDPE membrane material and field seams for visual inspection and testing.
 - 2. Shop drawings showing the following:
 - a. Proposed layout of the interim HDPE liner system.
 - b. Details of jointing the interim HDPE liner, anchoring, connections, penetrations and other construction details.
 - 3. Certificates of compliance with the requirements of standards specified herein for the interim HDPE liner and its installation.
 - 4. Installation and erection data and schedule, including a detailed schedule for covering the liner.
 - 5. Maintenance and repair requirements.
 - 6. Manufacturer's standard guarantee.
 - 7. A quality control manual that specifically defines the quality assurance program. Included in the manual shall be daily procedure, welding technique, field testing procedure, lab testing procedure, specific steps that are to be taken in the event of a failure or defect, personnel requirements, levels of authority, and all other information necessary to ensure a high quality liner installation.

8. The origin of the resin to be used in the manufacturing of liner including the supplier's name and production plant, as well as brand name and number. In addition, the CONTRACTOR shall include the Certificate of Analysis from the resin supplier.
9. A fingerprint of the manufacturer's liner properties as listed in Appendix A, Table A1. The purpose of these tests is to identify the manufacturer's liner product. The results of these tests shall be submitted to the USAID COTR OR DESIGNATE for approval of the product. Once the product is approved, all HDPE liner to be supplied for the Project shall be manufactured using the same resin type identified through fingerprinting tests.
10. Certification that all resin used in the manufacture of textured HDPE liner for this Project meets the approved fingerprinting protocol.
11. Copy of quality control certificates in conformance with Paragraphs 2.01 and 2.02.
12. Certification that the HDPE liner and extrudate produced for this project have the same properties.
13. A "sample warranty" in accordance with paragraph 1.08A.
14. Submittals relating to installing CONTRACTOR.
 - a. Background Information
 - b. Installation capabilities:
 - (1) Information on equipment (including tensiometer) and personnel.
 - (2) Anticipated average daily production (Complete including QC measures).
 - (3) A list of minimum values for seam properties.
 - c. A list of five completed facilities of comparable installations for which the installer has installed between the five facilities both smooth and textured HDPE liner. The following information shall be provided for each facility:
 - (1) Name and purpose of facility, its location and date of installation.
 - (2) Name of Owner, design engineer, manufacturer and name and telephone number of contact at the facility who can discuss the project.
 - (3) Thickness of liner and surface area of the installed liner.
 - (4) Type of seaming, patching and tacking equipment.
 - (5) A copy of the manufacturer's certification or approval letter.
 - (6) Resume of the qualifications of the Installation Supervisor and Master Seamer, and Quality Control personnel to be assigned to this project.
 - d. Shop drawings, including:
 - (1) Proposed panel layout of HDPE liner, field seams as well as any variance or additional details which deviate from the Drawings.
 - (2) Details of seaming the liner, anchoring, connections, penetrations and other construction details.

- e. Installation schedule.
- f. A quality control manual that specifically defines the quality assurance program during installation. The manual shall include daily procedures, welding techniques, field testing procedures, lab testing procedures, specific steps that are to be taken in the event of a failure or defect, personnel requirements, levels of authority and all other information necessary to ensure a high quality liner installation.
- g. Resume of the Installation Supervisor to be assigned to the Project.
- h. Resume of the Master Seamer to be assigned to the Project.
- i. Resume of the Quality Control person to be assigned to the project.
- j. A list of personnel performing field seaming operations along with pertinent experience information.

1.04 REFERENCE STANDARDS

Reference standards include, but are not limited to, the following:

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM D638 (NSF Modified) - Standard Test Method for Tensile Properties of Plastics.
 - 2. ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
 - 3. ASTM D1004 - Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
 - 4. ASTM D1238 - Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.
 - 5. ASTM D1505 - Standard Test Method for Density of Plastics by the Density-Gradient Technique.
 - 6. ASTM D1603 - Standard Test Method for Carbon Black in Olefin Plastics.
 - 7. ASTM D3895 - Standard Test Method for Copper-Induced Oxidative Induction Time of Polyolefins by Thermal Analysis.
 - 8. ASTM D4218 - Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
 - 9. ASTM D4833 – Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.
 - 10. ASTM D5199 - Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes

D. Field quality control requirements are specified in Paragraph 3.06. The purpose of field quality control procedures is to assure that the liner has been installed in accordance with the specifications and manufacturer's recommendations.

E. Quality Control Plan

1. The forms in Appendix C for liner quality control documentation shall be used for field installation documentation. Alternative forms, which provide the same level of detail, may be used for documentation as approved by the USAID COTR OR DESIGNATE.

F. Geomembrane Quality Control Documentation

1. Pre-installation Conference

- a. Prior to commencing work, a pre-installation conference shall be held and the following project personnel shall be identified by name and recorded in the project files:
- CONTRACTOR
 - CONTRACTOR's Representative
 - USAID COTR OR DESIGNATE (EFR)
 - Installation Supervisor : Quality Control Personnel
 - Installer
 - Quality Control Laboratory (QCL)
- b. Two duplicate project files shall be maintained. One shall be maintained by the USAID COTR OR DESIGNATE and the other shall be maintained by the Installation Supervisor. At the end of each work week the files shall be updated and checked to assure that copies of all pertinent project information are included in each file.
- c. Blank copies of the following eleven (11) project forms shall be available onsite throughout the duration of the project:

<u>Form No.</u>	<u>Title</u>
100	Liner Project QC Log
101	Receiving QC Log
102	Personnel QC Log
103	Subgrade Surface Acceptance
104	Daily QC Report Pre-Weld Testing
105	HDPE Liner Installation Tracking Log
106	Seaming Log
107	Patch Placement Log
108	Destructive Test Log
109	Damage and/or Failure Report
110	Protective Cover Daily Report

G. Record Drawings

1. The CONTRACTOR shall furnish AutoCAD record drawings showing changes, if any, from the approved installation drawings which are to include all destructive sample

locations, any patches used to repair liner defects, and all panel and patch identifications assigned in the field; and a copy of complete documentation for final installation of the liner.

1.06 QUALIFICATIONS

A. Manufacturer

1. The manufacturer of the lining material described hereunder shall have previously demonstrated his/her ability to produce this liner by having at least five years continuous experience in the manufacture of smooth and textured HDPE liner and successfully manufactured a minimum of 4.65 million square meters of similar liner material for hydraulic lining installations.

B. Installer

1. The installer shall be the manufacturer or an approved installer trained and certified to install the manufacturer's liner. Installation shall be performed under the constant direction of a single installation supervisor who shall remain on site and be in responsible charge, through the liner installation, for liner layout, seaming, patching, testing, repairs and all other activities required by the installer. The installation supervisor shall have installed or supervised the installation and seaming of a minimum of 186,000 square meters of smooth and textured HDPE liner.

1.07 DELIVERY, STORAGE AND HANDLING

- A. The liner rolls shall be packaged and shipped by appropriate means to prevent damage of the liner rolls. Off-loading and storage of the liner is the responsibility of the CONTRACTOR. The liner rolls shall be unloaded in the presence of the USAID COTR OR DESIGNATE or his representative. The CONTRACTOR shall be responsible for replacing any damaged or unacceptable material at no cost to the Owner.
- B. Damage during off-loading shall be documented by the USAID COTR OR DESIGNATE or his representative. All damaged rolls must be separated from the undamaged rolls until the proper disposition of that material has been determined by the USAID COTR OR DESIGNATE.
- C. The liner rolls shall be stored so as to be protected from puncture, dirt, grease, water, moisture, mud, mechanical abrasions and excessive heat that may damage the liner material. The rolls shall be stored on a prepared surface (not wooden pallets) and shall not be stacked more than two rolls high.

1.08 MATERIAL WARRANTY

- A. The HDPE liner manufacturer shall warrant the textured HDPE liner, on a prorated basis, against manufacturing defects and material degradation under outdoor exposure for a period of twenty years from the date of installation. The manufacturer shall replace at no expense any material which fails from the above causes within the warranty period. The manufacturer shall furnish a written warranty covering the requirements of this Paragraph.

1.09 GUARANTEE

- A. The CONTRACTOR shall guarantee the textured HDPE liner against defects in installation and workmanship for the period of two years commencing with the date of final acceptance. The guarantee shall include the services of qualified service technicians and all materials required for the repairs at no expense to the Owner.

1.10 DEFINITIONS AND RESPONSIBILITIES

A. CONTRACTOR

- 1. The CONTRACTOR is the firm or corporation with whom the Owner has entered into agreement to construct the project. The CONTRACTOR is responsible for all submittals by the manufacturer and the installer as required by the Specifications. The CONTRACTOR is responsible for scheduling and coordination of the required work with the manufacturer and the installer to complete the project. The CONTRACTOR is responsible for furnishing as built drawings and a copy of the complete documentation of the liner system. The CONTRACTOR is also responsible for daily updating of the design drawings onsite and for any and all deviations from these Drawings. All deviations must be initialed and approved by the USAID COTR OR DESIGNATE onsite.

B. Manufacturer

- 1. The manufacturer is the firm or corporation responsible for production of the liner material to be used in the project. The manufacturer shall produce a consistent product meeting the project specifications, and shall provide quality control documentation for the product specified herein. The Manufacturer is responsible for the condition of the geosynthetic until the material is accepted by the USAID COTR OR DESIGNATE upon delivery and installation. The Manufacturer shall produce a product that consistently meets the project specifications.

C. Installer

- 1. The installer is the firm responsible for installation of the liner. The installer shall be the manufacturer or an approved installer trained and certified to install the manufacturer's geomembrane. The Installer shall be responsible for field handling, storing, placing, seaming, field testing and all other aspects of the liner installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. General

- 1. The liner shall be manufactured of new, prime first-quality products designed and manufactured specifically for the purpose of liquid containment in hydraulic structures and chemically resistant to leachate. The liner shall be 40 mil GSE HD, or equal.
- 2. The liner material shall be so produced as to be free of holes, blisters, undispersed raw materials, or any sign of contamination by foreign matter.

3. The sheets shall be manufactured in a minimum 6.7 m seamless width. Labels on the roll shall identify the thickness, length, width, roll number and manufacturer's lot number.
4. The textured sheet must not delaminate during tensile testing (i.e., textured layers and "particles" of texture must not separate).

B. Properties

1. The liner rolls shall meet the minimum properties listed in Appendix B, Table B1.

C. Other Materials

1. Extrudate welding rods shall be of the same compound as the liner and supplied by the manufacturer and shall be delivered in the original sealed containers. Each container shall have a label bearing the brand name, manufacturer's lot number and complete directions as to proper storage.

2.02 QUALITY CONTROL DOCUMENTATION

A. Prior to installation commencement of any liner material, the CONTRACTOR shall provide the following information certified by the manufacturer for the delivered liner.

1. Origin, identification and production of the resin (supplier's name, brand name and production plant).
2. Copies of quality control certificates issued by the resin supplier.
3. Manufacturer's certification verifying that the quality of the resin used to manufacture the liner meets the fingerprint properties shown in Appendix A, Table A1.
4. Each roll delivered to the project site shall have the following identification information:
 - Manufacturer's name
 - Product identification
 - Thickness
 - Roll number
5. Quality control certificates, signed by the manufacturer's quality control manager. Each certificate shall have roll identification number, sampling procedures, frequency and test results. At a minimum the following test results shall be provided in accordance with test requirements specified in Appendix B:
 - Thickness
 - Density
 - Tensile properties
 - Tear resistance
 - Carbon black content
 - Carbon black dispersion

2.03 CONFORMANCE TESTING

- A. Conformance testing shall be performed by a GRI accredited independent Quality Control Laboratory (QCL) employed by the CONTRACTOR. One sample shall be taken per 9,300 square meters, or one sample per lot, whichever results in the greater number of conformance tests. A Lot number will be defined as a continuous production process without changes to raw material or manufacturing methods. This sampling frequency may be increased as deemed necessary by the USAID COTR OR DESIGNATE. **For every change in Lot number, the CONTRACTOR shall perform conformance testing on the initial roll at the CONTRACTOR's expense.** The USAID COTR OR DESIGNATE shall obtain the samples from the roll, and mark the machine direction and identification number. The following conformance tests shall be conducted at the laboratory:
- Thickness
 - Density
 - Tensile properties
 - Tear resistance
 - Carbon black content
 - Carbon black dispersion
- B. These conformance tests shall be performed in accordance with Appendix B.
- C. All conformance test results shall be reviewed by USAID COTR OR DESIGNATE and accepted or rejected, prior to the placement of the liner. All test results shall meet, or exceed, the property values listed in Appendix B. In case of failing test results, the manufacturer may request that another sample be retested by the independent laboratory with manufacturer's technical representative present during the testing procedures. This retesting shall be paid for by the manufacturer. The manufacturer may also have the sample retested at two different laboratories approved by the Owner. If both laboratories report passing results, the material shall be accepted. If both laboratories do not report passing results, all liner material from the lot representing the failing sample will be considered out of specification and rejected.

PART 3 EXECUTION

3.01 SOIL BASE PREPARATION

- A. Preparation of the soil base surface shall be as specified in Section 02200.
- B. Installation of the geosynthetic fabrics shall be as specified in Section 02273.
- C. The surface of the soil base shall be smooth, uniform, free from sudden changes in grade (such as vehicular ruts), rocks, stones, debris and deleterious materials. During actual placing and seaming of the liner, the soil base surface shall be kept free of all standing water. If the soil base surface below the liner becomes wet and unstable, it shall be dried and recompacted to the USAID COTR OR DESIGNATE's satisfaction. If drying and recompacting the material is insufficient, the unstable material must be removed and replaced with approved material.
- D. The installed geosynthetic fabric surface shall be free of wrinkles and folds, rocks, stones, debris, and deleterious materials.

- E. Before the liner installation begins, the CONTRACTOR and installer shall verify in writing and submit to the USAID COTR OR DESIGNATE:
 - 1. Lines and grades are in conformance with the Drawings and Specifications.
 - 2. The surface area to be lined has been rolled and compacted, and is free of irregularities and abrupt changes in grade.

3.02 LINER PLACEMENT

A. Weather Conditions

- 1. Liner placement shall not proceed at an ambient temperature below 0 degrees Celsius or above 40 degrees Celsius unless otherwise authorized, in writing, by the USAID COTR OR DESIGNATE or his/her field representative. Liner placement shall not be performed during periods of precipitation, excessive moisture, excessive wind, or in areas of ponded water.

B. Method of Placement

- 1. Each Liner panel shall be placed in accordance with the approved shop drawings prepared by the Manufacturer. The layout shall be designed to keep field joining of the textured HDPE liner to a minimum and consistent with proper methods of textured HDPE liner installation.
- 2. Each liner panel shall be identified by panel number, roll number and date of deployment. The liner panel number shall be placed on the ends and in the middle of each panel.
- 3. For liner placed on 4 to 1 or steeper slopes, the seams shall be oriented in the direction of the slope. Horizontal seams on 4 to 1 slopes or steeper shall not be allowed except for cases in which it is unavoidable. In these instances, a cap strip shall be placed over the seam.
- 4. The equipment used to deploy the liner shall not cause rutting of the soil base. If rutting of the soil base occurs, the CONTRACTOR shall suspend all liner placement activities and repair the ruts and immediately employ an alternative method for liner deployment. Liner rolls shall be placed using spreader and rolling bars with cloth slings. If a sheet must be relocated a distance greater than its width, a slip sheet shall be used.
- 5. The USAID COTR OR DESIGNATE shall inspect each panel, after placement and prior to seaming, for damage and/or defects. Defective or damaged panels shall be replaced or repaired, as approved by the USAID COTR OR DESIGNATE.
- 6. All liner shall be anchored as shown on the Drawings and consistent with manufacturer's recommendations. Sufficient liner shall be installed within the anchor trench to ensure proper installation prior to backfilling the trench.
- 7. Personnel working on the liner shall not smoke, wear damaging shoes or involve themselves in any activity that may damage the liner.

8. The liner shall be properly weighted with sand bags to avoid uplift due to wind.
9. Vehicular traffic across the liner shall not be allowed.
10. All damage shall be recorded and located on the record drawings.
11. When tying into existing liner, all exposure of previously installed liner shall be performed by hand to prevent damage.
12. The liner shall be kept free of debris, unnecessary tools and materials. In general, the liner area shall remain uncluttered in appearance. Any generators in use while on the liner shall have "drop" sheets placed underneath.
13. Fuel shall not be stored on the liner.

3.03 FIELD SEAMS

- A. Individual panels of liner shall be laid out and overlapped by a minimum of 10 cm prior to welding. The area to be welded shall be cleaned and prepared in accordance with the installer's quality control welding procedures.
- B. Double track hot wedge fusion welder shall be used for straight welds.
- C. Extrusion welder shall be used for cross seam tees, patches, repairs, penetration boots and detailed work.
- C. The welding equipment used shall be capable of continuously monitoring and controlling the temperature, speed, and pressure in the zone of contact where the machine is actually fusing the liner material so as to ensure that changes in environmental conditions will not affect the integrity of the weld.
- E. No "fish mouths" will be allowed within the seam area. Where "fish mouths" occur, the material shall be cut, overlapped and a patch fusion weld shall be applied. All welds upon completion of the work shall be tightly bonded. Any liner area showing injury due to excessive scuffing, puncture, or distress from any cause shall be replaced or repaired with an additional piece of liner. The number of patches per 30.5 m length shall not exceed five. If more than five patches per 30.5 m length are necessary, then the entire 30.5 m length of seam shall be removed. Further welding will cease at this time and the USAID COTR OR DESIGNATE shall be notified.
- F. All seams shall have a seam number that corresponds with the panel layout numbers. The numbering system shall be used in the development of the record drawings. Seam numbers shall be derived from the combination of the two panel numbers that are to be welded together.
- G. All fusion welded "T" seams (i.e., the result of the liner panels placed perpendicular to each other) shall be double welded where possible. The extrusion process shall be used for the second weld.
- H. All extrudate shall be free of dirt, dry and protected from damage.

- I. If an extrusion welder is stopped for longer than one minute, it shall be purged to remove heat-degraded extrudate. All purged extrudate shall be placed on a sacrificial sheet and disposed of.
- J. All seams constructed on sloped surfaces shall be vertical seams. Where horizontal seams can't be avoided (due to compounded slopes) on sideslope surfaces, a 45 cm wide cap strip of the same synthetic material shall be placed on top of the horizontal seam and welded to the adjacent panels to provide additional structural integrity. All cap strip seams shall be non-destructively tested.
- K. All vertical panels placed on sloped surfaces shall extend 1.5 m inward from the toe of slope or edge of trench.
- L. All end seams shall be staggered a minimum of 1.5 m in length between contiguous panels.
- M. To prevent moisture buildup during fusion welding, it may be necessary to place a movable protective layer of plastic directly below each overlap of liner that is to be seamed.
- N. If required, a firm substrate shall be provided by using a flat board or similar hard surface directly under the seam overlap to achieve proper support.
- O. All seams shall extend to the full extent of the anchor trench.
- P. All factory seams, field seams and repair welds shall meet seam strength requirements specified in Appendix B, Table B2.

3.04 SEAMING WEATHER CONDITIONS

A. Normal Weather Conditions

- 1. The normal required weather conditions for seaming are:
 - a. Ambient temperature higher than 0 degrees Celsius and lower than 40 degrees Celsius.
 - b. No precipitation or other excessive moisture, such as fog or dew.
 - c. No excessive winds.
- 2. These weather conditions shall be maintained during the seaming process.

B. Cold Weather Conditions

- 1. If the ambient temperature is below 0 degrees Celsius, the following conditions shall be met to ensure a quality seaming process:
 - a. Preheating the surface of the liner to achieve normal temperature range.

- b. Preheating may be waived by the USAID COTR OR DESIGNATE if the installer demonstrates that satisfactory welds of equivalent quality may be obtained without preheating at the expected temperature of installation.
- c. Preheating devices shall be approved by the manufacturer.
- d. Care shall be taken to assure that surface temperatures are not lowered below the minimum required surface temperature for welding due to winds.
- e. Additional destructive tests shall be taken at the discretion of the USAID COTR OR DESIGNATE.
- f. Test seams, as described in Paragraph 3.06A, shall be performed under the same ambient temperature conditions as the actual seams.

C. Warm Weather Conditions

- 1. If the ambient temperature is above 40 degrees Celsius, no seaming of liner shall be permitted unless the installer can demonstrate, to the satisfaction of the USAID COTR OR DESIGNATE that liner seam quality is not adversely impacted.
- 2. Test seams shall be performed under the same ambient temperature conditions as the actual seams.
- 3. Additional destructive tests shall be taken at the discretion of the USAID COTR OR DESIGNATE.

3.05 FIELD QUALITY CONTROL

A. Pre-Weld Testing

- 1. A test weld 90 cm long from each welding machine shall be run upon the beginning of each shift and every four hours thereafter, under the same conditions as exist for the liner welding. The test weld shall be marked with date, ambient temperature and welder's name, temperature, speed, and welding machine number. A tensiometer shall be required to be on-site before and during liner installation for the purpose of testing samples. Six specimens of welds 2.5 cm wide shall be cut from the test weld and tested on site with the presence of the USAID COTR OR DESIGNATE for shear and peel strength (3 each) in accordance with Appendix B, Table B-2. No welder may start work until the sample weld has been approved by the USAID COTR OR DESIGNATE.
- 2. Test seams shall be performed under the same conditions as the actual seams and shall be at least 90 cm long, 30 cm wide after seaming. Test seam material for welding shall be cut out of the liner rolls.

B. Nondestructive Seam Testing

- 1. The installer shall perform nondestructive tests on all field seams over their full length. The purpose of this test is to assure continuity and integrity of the seams. Vacuum and air pressure tests shall be used for nondestructive testing. The vacuum test shall be used

for extrusion welds and single track hot wedge welds. The air pressure test shall be used for double track hot wedge welds.

2. Vacuum Testing

- a. Equipment for testing single wedge fusion seams and extrusion seams shall be comprised of the following:
- (1) A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft rubber gasket attached to the bottom, port hole or valve assembly and a vacuum gage.
 - (2) A vacuum tank and pump assembly equipped with a pressure controller and pipe connections.
 - (3) A rubber pressure/vacuum hose with fittings and connections.
 - (4) A plastic bucket and wide paint brush.
 - (5) A soapy solution.
- b. The following procedures shall be followed by the installer:
- (1) Excess sheet overlap shall be trimmed away.
 - (2) Clean the window, gasket surfaces and check for leaks.
 - (3) Energize the vacuum pump and apply a vacuum of approximately 34.5 kPa (gage).
 - (4) Wet a strip of liner approximately 30 cm by 120 cm (length of box) with the soapy solution.
 - (5) Place the box over the wetted area and compress.
 - (6) Close the bleed valve and open the vacuum valve.
 - (7) Ensure that a leak-tight seal is created.
 - (8) For a minimum period of ten seconds, examine the liner through the viewing window for the presence of soap bubbles.
 - (9) If no bubbles appear after ten seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum of 7.5 cm overlap and repeat the process.
 - (10) All areas where soap bubbles appear shall be marked and repaired in accordance with Paragraph 3.07F and then retested.

- 11) All test locations which have passed vacuum testing shall be marked with the test date and individual performing the test.
- c. If the seam cannot be tested prior to final installation, the seaming operations shall be observed by the USAID COTR OR DESIGNATE for uniformity and completeness.
3. Air Pressure Testing
- a. The following procedures are applicable to those processes which produce a double seam with an enclosed space.
 - b. Equipment for testing double fusion seams shall be comprised of the following:
 - (1) An air pump equipped with pressure gage capable of generating and sustaining a pressure between 172 and 207 kPa (gage) and mounted on a cushion to protect the liner.
 - (2) A manometer equipped with a sharp hollow needle, or other approved pressure feed device.
 - c. The following procedures shall be followed by the installer.
 - (1) Seal both ends of the seam to be tested.
 - (2) Insert needle or other approved pressure feed device into the air channel created by the double wedge fusion weld.
 - (3) Energize the air pump to a pressure of 207 kPa (gage), close valve and sustain pressure for at least five minutes.
 - (4) If loss of pressure exceeds 20.7 kPa (gage), or pressure does not stabilize, locate faulty area, repair in accordance with Paragraph 3.07F and retest in accordance with Paragraph 3.07G.
 - (5) If the faulty area cannot be isolated and repaired, the length of seam which cannot be tested shall be capped with liner strip, extrusion welded and vacuum tested. The seam shall be documented as a failed seam indicating the corrective measure.
 - (6) If loss of pressure is 20.7 kPa (gage) or less, release air pressure at the opposite end of where the pressure is applied to verify that the full seam was pressurized and that there was no blockage in the air channel.
 - (7) Remove needle or other approved pressure feed device and seal.
 - (8) All test locations which have passed air pressure testing shall be marked with the test date and individual performing the test.
 - d. Destructive seam testing shall be performed in accordance with Paragraph 3.07.

3.06 DESTRUCTIVE SEAM TESTING

- A. The purpose of the destructive testing is to evaluate seam strength properties. A minimum of one test sample shall be obtained per 152 m of performed seam length or one sample per crew per day whichever yields the largest number of samples. The location of samples shall be determined by the USAID COTR OR DESIGNATE. Selection of such locations may be prompted by suspicion of overheating, contamination, or other potential cause that may adversely impact the welds. Sampling shall be performed by the installer. The CONTRACTOR shall forward the samples to the QCL for testing and shall pay for the testing.
- B. Sampling Procedures
1. Samples shall be cut by the installer at locations chosen by the USAID COTR OR DESIGNATE as the seaming progresses.
 2. The seams shall not be covered by another material before the test samples have been tested by the QCL and accepted by USAID COTR OR DESIGNATE.
 3. Upon obtaining each sample, assign a number to the sample and mark it accordingly.
 4. Record sample location on layout drawing.
 5. Record purpose of the sample, statistical routine or suspicious weld area.
 6. Holes in the liner resulting from destructive seam testing shall be immediately repaired in accordance with Paragraph 3.07F and tested in accordance with Paragraph 3.07G.
- C. Size and Disposition of Samples
1. The sample for laboratory testing shall be 30 cm wide by 90 cm long with the seam centered lengthwise. The sample shall be cut into three parts and distributed as follows:
 - a. One portion to the installer for field testing, 30 cm by 30 cm.
 - b. One portion for Quality Control Laboratory testing, 30 cm by 30 cm.
 - c. One portion to the USAID COTR OR DESIGNATE for archive storage, 30 cm by 30 cm.
- D. Quality Control Laboratory Test
1. The CONTRACTOR shall package and ship destructive test samples to the GRI accredited independent Quality Control Laboratory (QCL) employed by the CONTRACTOR.
 2. Laboratory test shall include shear and peel strength tests. The minimum acceptable values obtained in these tests shall be in accordance with Appendix B, Table B-2.

3. The laboratory shall cut the sample to one inch wide coupons using a die or other means. At least ten (10) coupons shall be cut for peel and shear test.
4. Five coupons shall be tested each for shear and the other five shall be tested for peel strength. A passing test shall meet the minimum required values for four of the five coupons tested for each method.
5. The QCL shall provide verbal test results to the USAID COTR OR DESIGNATE no more than 48 hours after they receive the samples. The USAID COTR OR DESIGNATE shall review the laboratory results as soon as they become available.

E. Procedures for Destructive Test Failure

1. The following procedures shall apply whenever a sample fails a destructive test. The installer has two options:
 - a. The installer can repair the seam between any two passing test locations; or
 - b. Two new samples can be taken at a minimum of 3 m on each side of the original failed sample. These samples shall be sent to the Quality Control Laboratory for testing. Subsequent failure of test samples shall cause the testing to move further down the seam until the extent of the faulty seam has been determined.
 - c. In the event the whole seam is determined to be faulty. The USAID COTR OR DESIGNATE may request samples to be taken from the previous seam welded by the same machine and welder, until two passing tests are obtained.
2. All acceptable repaired seams shall be bound by two passing locations. In cases where repaired seam exceeds 45.7 m, a sample taken from the zone in which the seam has been repaired must pass destructive testing. Repairs shall be made in accordance with Paragraph 3.07F and tested in accordance with Paragraph 3.07G.
3. The USAID COTR OR DESIGNATE shall document all actions taken in conjunction with destructive test failures.

F. Repair Procedures

1. Any portion of the liner exhibiting signs of defect or failing a destructive or a nondestructive test, shall be repaired. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be made by the USAID COTR OR DESIGNATE.
2. The repair procedures available include:
 - a. Patching, used to repair large holes, tears, undispersed raw materials and contamination by foreign matter.
 - b. Spot welding or seaming, used to repair small tears, pinholes, or other minor, localized defects.

- c. Capping, used to repair large lengths of failed seams.
 - d. Removing bad seam and replacing with a strip of new material welded in place.
 - e. For small lengths of failed seam (less than 90 cm), extrusion welding can be used to repair provided there is sufficient overlap between the two liner panels.
 - f. Extrusion welding the flap of a fusion welded seam is not an acceptable repair procedure.
3. For any repair method, the following provisions shall be satisfied:
- a. Surfaces of the liner which are to be repaired using extrusion methods shall be abraded no more than one hour prior to the repair.
 - b. All surfaces shall be clean and dry at the time of the repair.

G. Repair Verification

- 1. Each repair shall be numbered and logged by the installer. Each repair shall be nondestructively tested using the methods described in Paragraph 3.06 as appropriate. Repairs which pass the nondestructive test shall be taken as an indication of an adequate repair. Repairs more than 45.7 cm long may be of sufficient length to require destructive test sampling, at the discretion of the USAID COTR OR DESIGNATE. In the event of additional failing tests, the repair shall be redone and retested until passing test results are achieved. The USAID COTR OR DESIGNATE shall observe all nondestructive testing of repairs. The installer shall record the number of each repair, date and test outcome.

3.07 ELECTRIC CONDUCTIVITY TESTING (Not Used)

3.08 DISPOSAL OF WASTE MATERIAL

- A. Upon completion of installation, the CONTRACTOR shall dispose of all trash, waste material and equipment used in connection with the performed Work and shall leave the premises in a neat and acceptable condition.

APPENDIX A

TABLE A1
 FINGERPRINTING PROPERTIES FOR SMOOTH AND TEXTURED HIGH DENSITY
 POLYETHYLENE LINER

<u>PROPERTY</u>	<u>TEST METHOD</u>
Density	ASTM D792 or ASTM D1505
Melt Index	ASTM D1238
High Load Melt Index	ASTM D1238
Carbon Black Content	ASTM D1603
Oxidative Induction Time	ASTM D3895
Carbon Black Content	ASTM D1603
Carbon Black Dispersion	ASTM D3015

The above tests shall be performed by the manufacturer of the smooth and textured HDPE liner for identification of the manufacturer's product. The above test results shall be submitted to the USAID COTR OR DESIGNATE for approval of the product. The liner to be supplied for the project shall meet these fingerprinting properties.

APPENDIX B

TABLE B1
MATERIAL PROPERTIES
SMOOTH AND TEXTURED HIGH DENSITY POLYETHYLENE (HDPE) LINER

<u>PROPERTY</u>	<u>UNIT</u>	<u>LIMIT</u>	<u>METHOD</u>	<u>VALUE</u>
Thickness	mils	min. avg.	ASTM D5994	40 (36 min)
Density	g/cc	min. avg.	ASTM D1505	.940
Tensile Properties (Each Direction)			ASTM D638	
1. Yield Strength	kN/m	min. avg.		14.9
2. Break Strength	kN/m	min. avg.		28.8 smooth 10.7 textured
3. Elongation at Yield %		min. avg.		13
4. Elongation at Break %		min. avg.		700 smooth 150 textured
Tear Resistance N		min. avg.	ASTM D1004	124.5
Puncture Resistance N		min. avg.	ASTM D4833	351.4 smooth 320.3 textured
Dimensional Stability %		max. avg.	ASTM D1204	±2
Environmental Stress Crack Hours		min.	ASTM D5397	200
Carbon Black Content %		range	ASTM D1603 or ASTM D4218	2.0 to 3.0
Carbon Black Dispersion		N/A rating	ASTM D5596	Categories 1 or 2 For 10 views
Oxidative Induction Time		min. avg.	ASTM D3895	>100

Note: Unless otherwise indicated, values apply to both smooth and textured liner.

TABLE B2

FACTORY AND FIELD SEAMS PROPERTIES
SMOOTH AND TEXTURED HIGH DENSITY POLYETHYLENE (HDPE) LINER

<u>PROPERTY</u>	<u>UNIT</u>	<u>TEST METHOD</u>	<u>MINIMUM VALUE</u>
Bonded Shear Strength:	kN/m	ASTM D638 Type V	FTB and 21.4
Seam Peel Adhesion (hot wedge):	kN/m	ASTM D638 Type V	FTB and 17.4
Seam Peel Adhesion (extrusion):	kN/m	ASTM D638 Type V	FTB and 13.9

FTB is Film Tear Bond.

Seam Peel Adhesion (hot wedge and extrusion) must meet minimum value requirements with a maximum of 10% peel.

APPENDIX C
GEOMEMBRANE QUALITY
CONTROL DOCUMENTATION FORMS

The following forms are included and shall be completed by the responsible party as shown on the forms.

<u>Form No.</u>	<u>Title</u>
CQC - 100	Liner Project QC Log
CQC - 101	Receiving QC Log
CQC - 102	Personnel QC Log
CQC - 103	Subgrade Surface Acceptance
CQC - 104	Daily QC Report Pre-weld Testing
CQC - 105	HDPE Liner Installation Tracking Log
CQC - 106	Seaming Log
CQC - 107	Patch Placement Log
CQC - 108	Destructive Test Log
CQC - 109	Damage and/or Failure Report
CQC - 110	Protective Cover Daily Report

FORM CQC - 100
LINER PROJECT QC LOG
(one sheet per project)

PROJECT

NAME: _____

NUMBER: _____

LOCATION: _____

OWNER: _____

ADDRESS: _____

CONTACT: _____ PHONE: _____

ENGINEERING

ENGINEERING FIRM: _____

ADDRESS: _____

CONTACT: _____ PHONE: _____

CONTRACTOR

GENERAL CONTRACTOR: _____

ADDRESS: _____

CONTACT: _____ PHONE: _____

SUPPLIER OF LINER MATERIALS

NAME: _____

ADDRESS: _____

CONTACT: _____ PHONE: _____

FORM CQC - 100
LINER PROJECT QC LOG
(one sheet per project)
(Continued)

QC INSPECTION

NAME: _____

ADDRESS: _____

CONTACT: _____ PHONE: _____

TESTING LABORATORY

LINER TESTING LABORATORY: _____

ADDRESS: _____

CONTACT: _____ PHONE: _____

FABRICATOR OF MATERIAL

NAME: _____

ADDRESS: _____

CONTACT: _____

INSTALLER OF MATERIAL

NAME: _____

ADDRESS: _____

CONTACT: _____

LINER MATERIALS

SPECIFIED LINER MATERIALS: _____ THICKNESS & TYPE: _____

MATERIAL CERTIFICATION

MATERIAL CERTIFICATION RECEIVED: _____

DATE: _____ ACCEPTED: _____

FORM CQC - 101
RECEIVING QC LOG
(one sheet per truck)

PROJECT NAME: _____

DATE: _____ TIME: _____ PROJECT NUMBER: _____

TRUCKERS ID: _____

NO. OF PIECES ON BOARD: _____ AGREE WITH PACKING LIST? _____

CONDITION OF PACKAGING: _____

VERIFY PROPER MATERIALS: _____ VERIFY PROPER THICKNESS: _____

IDENTIFY ROLL NUMBERS: _____

IDENTIFY ACCESSORIES (*adhesive, battens, boots, etc.*): _____

IDENTIFY DAMAGED ITEMS: _____

TYPE OF UNLOADING EQUIPMENT USED: _____

OPERATOR: _____

COMMENTS: _____

STORAGE AREA

CONDITION (*surface*): _____

LOCATION TO PLACEMENT AREA: _____

MATERIAL PROPERLY COVERED: _____

WEATHER

CONDITIONS: _____ TEMP: _____

SIGNATURES

QC INSPECTOR: _____

SITE SUPERVISOR: _____

Use back for other comments

FORM CQC - 102
PERSONNEL QC LOG
(installation & field seaming personnel)
(complete for each mobilization or change of personnel)

PROJECT NAME: _____

DATE: _____ PROJECT NUMBER: _____

SAFETY MEETING CONDUCTED ON MATERIALS HANDLING: _____

GIVEN BY: _____ DATE: _____

SUPERINTENDENT OF INSTALLATION: _____

SEAMING CREW PERSONNEL

#1 CREW LEADER: _____ HELPER: _____

#2 CREW LEADER: _____ HELPER: _____

#3 CREW LEADER: _____ HELPER: _____

#4 CREW LEADER: _____ HELPER: _____

#5 CREW LEADER: _____ HELPER: _____

#6 CREW LEADER: _____ HELPER: _____

#7 CREW LEADER: _____ HELPER: _____

#8 CREW LEADER: _____ HELPER: _____

OTHER CREW MEMBERS

NAME: _____ NAME: _____

NAME: _____ NAME: _____

NAME: _____ NAME: _____

SIGNED: _____

QC Inspector

FORM CQC - 103
SUBGRADE SURFACE ACCEPTANCE
(once sheet per Day of Liner Deployment)

1. Surface for liner placement accepted, covered by panel numbers: _____

Approximate size of area: _____

**CERTIFICATE OF ACCEPTANCE
OF SUBGRADE SOIL BY INSTALLER**

I the undersigned, duly authorized representative of _____ do hereby
accept the soil surface as being acceptable for the placement of a geomembrane liner.

_____ Name	_____ Signature	_____ Title	_____ Date
---------------	--------------------	----------------	---------------

Certificate Accepted by Inspector - Company: _____

_____ Name	_____ Signature	_____ Title	_____ Date
---------------	--------------------	----------------	---------------

QC INSPECTOR: _____

SITE SUPERVISOR: _____

INSTALLING SUPERVISOR: _____

COMMENTS

**FORM CQC - 106
SEAMING LOG
(one sheet per day)**

DATE: _____ JOB NAME: _____ JOB NO.: _____ MATERIAL: _____

AMBIENT TEMP.: _____ AM _____ PM _____ WIND: AM _____ PM _____ WEATHER: _____ AM _____ PM _____

LOCATION		INSTALLATION					WEDGE WELD		EXTRUSI ON WELD		COMMENTS
TIME	SEAM NO.	LENGTH	TECH	MACH ID. NO.	MACH. TEMP.	SPEED	STAR T KPA	FINIS H KPA	VAC. TEST Y/N	PASS/ FAIL	

COMMENTS: _____

DAILY TOTALS: Liner _____ sq. m, Length Seamed _____ m, No. Destructs marked _____ Anchor Trench: Dug _____ Accepted _____

FORM CQC - 107
PATCH PLACEMENT LOG
(one sheet per day)

DATE: _____ JOB NAME: _____ JOB NO.: _____ MATERIAL: _____

AMBIENT TEMP.: _____ AM _____ PM _____ WIND: AM _____ PM _____ WEATHER: _____ AM _____ PM _____

TIME	PATCH NO.	DESCRIPTION LOCATION	INSTALLATION			EXTRUSI ON WELD	PASS/ FAIL	COMMENTS
			TECH.	MACH ID. NO.	MACH. TEMP.	VAC. TEST Y/N		

COMMENTS: _____

DAILY TOTALS: Liner _____ sq. m, Length Seamed _____ m, No. Destructs marked _____

FORM CQC - 109
DAMAGE AND/OR FAILURE REPORT

JOB NAME: _____ JOB NO.: _____ PAGE: _____

DATE	PANEL NO.	SEAM NO.	LOCATION OF DAMAGE	TYPE OF DAMAGE OR FAILURE	TYPE OF REPAIR	NEW SEAM NO.	NEW PATCH NO.

COMMENTS: _____

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SECTION 02821
SECURITY FENCING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals necessary and install all chain-link fabric fencing and gates as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Site Preparation is included in Section 01410.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, shop drawings showing layout and details of fencing, fence corners, and gates.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
 - 2. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - 3. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 4. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric
 - 5. ASTM A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High Strength Low-Alloy with Improved Formability
 - 6. ASTM F626 – Standard Specification for Fence Fittings
 - 7. ASTM F668 - Standard Specification for Poly (Vinyl Chloride) (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric
 - 8. ASTM A780 - Standard Specification for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
 - 9. ASTM F1043 – Standard Specification for Strength and Protective Coating on Metal Industrial Chain-Link Fence Framework [Replaced F669]

10. ASTM F1083 – Standard Specification for Pipe, Steel, Hot-Dipped Zinc Coated (Galvanized) Welded, for Fence Structures

- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

PART 2 PRODUCTS

2.01 GENERAL

- A. The CONTRACTOR shall provide security fencing to the height as indicated on the Drawings or as specified herein. The fence fabric height shall be at least 2 m with 3 strands of barbed wire on top. The location of the security fence is shown on the Drawings.
- B. The CONTRACTOR shall provide posts, rails and supports of the dimension indicated on the Drawings, as specified herein, or as required. Dimensions of posts, rails, and supports shall be outside dimensions exclusive of coatings.
- C. The CONTRACTOR shall provide steel fabric as required, shown on the Drawings and as specified below:
1. No. 9-gauge, 5-cm diamond mesh steel chain-link fabric with Class 1 zinc coating meeting ASTM A392. Furnish 1-piece fabric widths.
 2. Knuckled selvage on top, twisted selvage on bottom.
- D. The CONTRACTOR shall provide steel framework as required, shown, or specified below.
1. General: Galvanized steel, ASTM A53, with no less than 0.5 kg per zinc per square meter (kg/m^2) of surface, or steel conforming to ASTM A1011 externally triple coated with hot dip galvanizing at 0.3 kg/m^2 , chromatic conversion coating and clear acrylic polyurethane and coated internally with zinc rich coating.
 2. Fittings and Accessories: Galvanized, ASTM A153 with zinc weights per Table I.
 3. Steel Framework Finish: Provide framework, fittings and accessories in accordance with MANUFACTURER's standard thermally bonded PVC plastic resin finish over galvanizing, not less than 0.25-mm thick. Color to match chain link fabric.
- E. The CONTRACTOR shall provide steel posts, tension wire and braces as required, shown and specified below.
1. Posts, Security Fence:
 - a. End, Angle, Corner or Pull Posts: 6-cm O.D. with 2.8-mm wall thickness

- b. Line Posts: 6-cm O.D. with 2.4-mm wall thickness
 - c. In lieu of pipe specified above, steel pipe conforming to ASTM A1011 or greater strength, but less wall thickness, will be acceptable.
 - 2. Posts, Handrail: 38-mm diameter extra strong pipe at 5.35 kg/meter.
 - 3. Gate Posts: Furnish posts for supporting double gate installation, with a gate post of 10-cm O.D. and 13.55 kg/meter.
 - 4. Top and Bottom Rail: The structure security fence shall have 38-mm diameter standard pipe at 4.05 kg/meter for top and bottom rails. The handrail shall consist of 38-mm diameter standard pipe for top and bottom rail as well as additional framing.
 - 5. Tension Wire: No. 7 gauge coiled spring wire, metal and finish to match fabric, conforming to ASTM A824. Locate at bottom of security fence.
 - 6. Wire Ties: 11 gauge galvanized steel (to match fabric core material)
 - 7. Post Bracing:
 - a. Diagonal adjustable rods three-eighths inch in diameter equipped with adjustable tightener
 - b. Horizontal Braces: 42-mm O.D. at 3.38 kg/meter.
 - 8. Post Tops:
 - a. Designed as a weathertight closure cap for tubular posts
 - b. Malleable iron or pressed steel or aluminum alloy
 - 9. Stretcher Bars:
 - a. One piece, full height of fabric
 - b. 80-mm by 19-mm, galvanized
 - c. Bands of galvanized steel or malleable iron
- F. Barbed Wire and Supporting Arms:
- 1. Barbed Wire Supporting Arms: One for each post as indicated. Extend vertical pipes to connect barbed wire.
 - a. Single arm at 45 degrees with vertical, sloping to outside of fence
 - b. Constructed for attaching three rows of barbed wire to each arm and designed as a weathertight closure cap

- c. Designed for 110-kg minimum pull-down load
- d. Attached to steel posts or integral with post top
- e. Provided with openings to receive top rail
- f. Cast iron galvanized

2. Barbed Wire:

- a. Two-strand, 12-gauge wire with 14-gauge, 4-point barbs 5 inches O.C.
- b. Metal and finish to match fabric
- c. Three rows required

G. Gates - Manual-Swing: The CONTRACTOR shall furnish manual swing gates meeting ASTM F900, and as follows:

1. Framing:

- a. Fabricate perimeter frames of gates from metal and finish to match fence framework.
- b. Provide intermediate horizontal and vertical members for proper gate operation and for attachment of fabric, hardware and accessories. Space so that frame members are not more than eight feet apart unless otherwise indicated.
- c. Frames assembled by welding or watertight galvanized steel rigid fittings.
- d. Fabric to match that of fence. Install fabric with stretcher bars at vertical and top and bottom edges.
- e. Diagonal cross bracing of three-eighths inch diameter adjustable truss rods to ensure frame rigidity without sag or twist.
- f. Where barbed wire is indicated or specified, extend gate end members one foot above top members to receive barbed wire.

2. Hardware:

- a. Hinges of pressed or forged steel or malleable iron, non lift-off type, offset to permit 180-degree (outward) gate opening, one and one-half inch pair per leaf.

- b. Latches and Gate Stops: Double leaf
 - i. Plunger-bar type latch, full gate height, designed to engage gate stop of flush-plate type, with anchors
 - ii. Locking device and padlock eyes an integral part of latch
 - iii. Keeper to automatically engage gate leaf and secure free end of gate in open position
- 3. Coating: Hot-dip galvanize conforming to ASTM A153.

PART 3 EXECUTION

3.01 INSTALLATION

A. Fence and Handrail

1. Install framework, fabric, and accessories in accordance with ASTM F567.
2. Posts: Posts shall be set in concrete with minimum hole diameters equal to four times the post diameter and with a minimum depth of 1-meter. Set post in a vertical position, plumb and in line. Place 3,000 psi concrete into hole and extend 5-cm above grade. Crown the concrete top and extend the bottom of the footing a minimum of 5-cm below the bottom of the post.
 - a. For the portion of the post embedded in concrete or below finished grade, coat with coal tar epoxy to two inches above grade.
 - b. When solid rock or concrete is encountered, without overburden of soil, set posts to a depth of four times the diameter of the post with a hole size a 12-mm larger than the post diameter. The post shall set in non-shrink grout with a crown to shed water. When rock or concrete is encountered with an overburden of soil the posts shall be set to the full depth as specified above. Space posts as indicated.
3. Place corner or terminal posts every 15 m and at all bends. Equally space line posts between terminal posts or corner posts, at intervals not exceeding 3 m.
4. Post Bracing:
 - a. Install horizontal center brace rail and diagonal truss rod at each corner post, terminal post, and gate post. Install bottom brace rail on gate leaves.
 - b. Install so posts are plumb when diagonal rod is under tension.
5. Provide top rail continuous through line posts. Splice top rail with top rail sleeves.
6. Tension Wire: Weave through the fabric and tie to each post with minimum 6-gauge wire to match fabric finish.

7. Fabric: Stretch taut with equal tension on each side of line posts.
 - a. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.
 - b. Position bottom of fabric at finished grade. Do not allow finished grade to encroach onto fabric.
 - c. Use U-shaped wire, conforming to diameter of pipe to that attached, clasping pipe and fabric firmly with ends twisted at least two full turns. Bend ends of wire to minimize hazard to persons or clothing.
 - d. Fasten fabric to steel posts with wire ties spaced 30 cm O.C. maximum.
 - e. Fasten fabric to tension wire using 11-gauge galvanized steel hog rings spaced at 60 cm O.C.
8. Stretcher Bars:
 - a. Thread through or clamp to fabric four inches O.C.
 - b. Secure to posts with metal bands spaced 38 cm O.C. maximum.
 - c. Install at each end post and each side of corner post.
9. Post Tops: Install on each post.
10. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. (Peen ends of bolts or score threads to prevent removal of nuts).
11. Gates:
 - a. Field verify gate opening dimensions for gate frame fabrication. Install gates in accordance with ASTM F567. Proposed grades: Check cross slopes and grades along fence lines to position gates. Maintain 10 cm maximum clearance beneath gate frames to finished grade.
 - b. Install gates with fabric to match fence. Install three hinges per leaf, latch, catches, drop bolt foot bolts and sockets, torsion spring, retainer, and locking clamp. Install a center stop in concrete for swing gate drop rods. Install gate catcher with post at full gate openings.
12. Field welds will not be allowed, except for attachment of posts to anchor plates on structure walls, without prior written authorization from the USAID COTR OR DESIGNATE.

B. Repairing Damaged Coatings:

1. Repair damaged galvanized surfaces as a result of welding with paint containing zinc dust in accordance with ASTM A780. Prior to painting, the damaged surface shall be prepared using mechanical means to remove all flux residues and weld spatter. Paint to minimum 0.2 mm dry thickness.
2. Apply per MANUFACTURER's recommendations.

END OF SECTION

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SECTION 02901

MISCELLANEOUS WORK AND CLEANUP

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to do the miscellaneous work not specified in other sections but obviously necessary for the proper completion of the work as shown on the Drawings, Remediation Work Plan, Site Health and Safety Plan, and Site-Wide Sampling and Analysis Plan.
- B. When applicable the CONTRACTOR shall perform the work in accordance with other sections of this Specification or documents mentioned in Part 1.01.A. When no applicable specification exists the CONTRACTOR shall perform the work in accordance with the best modern practice and/or as directed by the USAID COTR OR DESIGNATE.
- C. The work of this Section includes, but is not limited to, the following:
 - 1. Construction and maintenance of temporary access roads and any necessary drainage, erosion, or sedimentation control structures or measures.
 - 2. Crossing and relocating existing utilities.
 - 3. Restoring of existing roadways and pavements.
 - 4. Cleaning up.
 - 5. Incidental work.
 - 6. Construction schedules.
 - 7. Construction photographs.
 - 8. Project record documents.
 - 9. Traffic control.
 - 10. Protection and/or removal and reinstallation of signs.
 - 11. Protection and bracing of utility poles.
 - 12. Temporary construction facilities.
 - 13. Equipment decontamination stations.
 - 14. Pre-mobilization and equipment layout plan.
 - 15. Implementation plan.

16. Health and safety plan.
17. Environmental protection plan.
18. Final report.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials required for this Section shall be the same quality of materials that are to be restored. Where possible, the CONTRACTOR may reuse existing materials that are removed.

PART 3 EXECUTION

3.01 CROSSING AND RELOCATING EXISTING UTILITIES

- A. This Item includes work required in crossing culverts, water courses, including drainage ditches, storm drains, gas mains, water mains, electric, telephone, gas and water services and other utilities. This work shall include but is not limited to the following: bracing, hand excavation and backfill (except screened gravel) and any other work required for crossing the utility or obstruction not included for payment in other items of this specification.
- B. In locations where existing utilities cannot be crossed without interfering with the construction of the work as shown on the Drawings, the CONTRACTOR shall remove and relocate the utility as directed by the USAID COTR OR DESIGNATE or cooperate with the Utility Companies concerned if they relocate their own utility.
- C. At pipe crossings and where designated by the USAID COTR OR DESIGNATE, the CONTRACTOR shall furnish and place screened gravel bedding so that the existing utility or pipe is firmly supported for its entire exposed length. The bedding shall extend to the mid-diameter of the pipe crossed.

3.02 RESTORING OF ROADWAYS

- A. Existing roadways disturbed by the construction shall be replaced. Paved drives shall be repaved to the limits and thicknesses existing prior to construction. Gravel drives shall be replaced and regraded.

3.03 CLEANING UP

- A. The CONTRACTOR shall remove all construction material, excess excavation, buildings, equipment and other debris remaining on the job as a result of construction operations and shall restore the site of the work to a neat and orderly condition.

3.04 INCIDENTAL WORK

- A. Do all incidental work not otherwise specified, but obviously necessary to the proper completion of the Contract as specified and as shown on the Drawings.

3.05 TEMPORARY CONSTRUCTION FACILITIES

- A. The CONTRACTOR shall furnish, install, maintain and remove all temporary facilities required for construction or called for in the specifications.

END OF SECTION

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SECTION 02985

SEEDING AND MULCHING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. The CONTRACTOR shall furnish all labor, materials, equipment, and incidentals necessary and finish grade, seed, and maintain all seeded areas as specified herein including all areas disturbed by the CONTRACTOR's operations.

1.02 SUBMITTALS

- A. Submit to the USAID COTR OR DESIGNATE for review complete shop drawings for all materials and equipment furnished under this Section, including seed mixtures and product label information.
- B. Samples of all materials shall be submitted for inspection and acceptance upon USAID COTR OR DESIGNATE's request.
- C. The CONTRACTOR shall submit a certified survey in accordance with Section 01050.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Fertilizer shall be complete commercial fertilizer, 19-19-19 grade. It shall be delivered to the site in the original unopened containers each showing the manufacturer's guaranteed analysis. Store fertilizer so that when used it shall be dry and free flowing.
- B. Lime shall be ground limestone containing not less than 85 percent calcium and magnesium carbonates. Liquid lime will not be an acceptable substitute for agricultural lime.
- C. Seed shall be from the same or previous year's crop; each variety of seed shall have a percentage of germination not less than 90, a percentage of purity not less than 85, and shall have not more than one percent weed content.
- D. The seed shall be furnished and delivered premixed in the proportions specified in Paragraph 3.01 E. A manufacturer's certificate of compliance to the specified mixes shall be submitted by the manufacturer for each seed type. These certificates shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed may be sown until the CONTRACTOR has submitted the certificates.
- E. Seed shall be delivered in sealed containers bearing the dealer's guaranteed analysis.
- F. Mulch shall be clean small-grain straw.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Seed all disturbed areas of construction outside the designated liner limits of the disposal unit (excluding roads).
- B. No seeding should be undertaken in windy or unfavorable weather, when the ground is too wet to rake easily, when it is in a frozen condition, or too dry.
- C. The subgrade of all areas to be seeded shall be raked and all rubbish, sticks, roots, and stones larger than 2 inches shall be removed.
- D. Fertilizer shall be uniformly spread and disked or roto-tilled to a depth of at least 10 cm.
- E. Immediately following surface preparation the seed shall be uniformly applied and lightly raked into the surface. Lightly roll the surface and water with fine spray. Seed shall be applied at the rates identified below. The CONTRACTOR may submit alternative rates to the USAID COTR OR DESIGNATE.

Temporary Seeding

Seed	125 kg/hectare
Lime	2,200 kg/hectare
10-10-10 Fertilizer	850 kg/hectare

Permanent Seeding

Seed	150 kg/hectare
Lime	4,400 kg/hectare
10-10-10 Fertilizer	1,100 kg/hectare

- F. All seeded areas shall be mulched with clean small-grain straw at a rate of 3,000 to 3,500 kilograms per hectare. Hydro Mulch Tact shall be applied uniformly at a rate of 6,500 gallons per hectare to tack the mulch, unless otherwise shown on the plans. Mechanical tacking will be considered on a case-by-case basis as approved by the USAID COTR OR DESIGNATE.
- G. The CONTRACTOR shall keep all seeded areas watered and in good condition. Reseeding shall be done if and when necessary until a good, healthy, uniform growth is established over the entire area seeded. Payment for areas seeded and mulched will not be approved until the establishment of healthy, uniform grass growth as examined and approved by the USAID COTR OR DESIGNATE.
- H. On slopes, the CONTRACTOR shall provide against washouts by an approved method. Any washout which occurs shall be regraded and reseeded at the CONTRACTOR's expense until good sod is established.
- I. Temporary Seeding shall be performed as necessary to comply with all applicable regulations, the sedimentation and erosion control plan and applicable permits. CONTRACTOR shall use a seed mix that is suitable for the growing conditions that are

encountered and shall apply fertilizer, lime and mulch as required to temporarily stabilize disturbed areas.

3.02 MAINTENANCE

- A. The CONTRACTOR shall maintain all seeded areas in a condition approved by the USAID COTR OR DESIGNATE until final acceptance of the Contract. Maintenance shall include, but not be limited to, mowing, raking clippings and leaves, repair of seeded areas, irrigation, and weed control. Protection shall be provided for all seeded areas against trespassing and damage. Slopes shall be protected from damage due to erosion, settlement, and other causes and shall be repaired promptly.
- B. Mowing shall be scheduled so as to maintain a minimum stand height of 10 cm. Stand height shall be allowed to reach 15-20 cm prior to mowing.
- C. All seeded areas shall be inspected on a regular basis and any necessary repairs or reseeded made within the planting season, if possible.

END OF SECTION

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SECTION 03100

CONCRETE FORMWORK

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and design, install and remove formwork for cast-in-place concrete as shown on the Drawings and as specified herein.
- B. Secure to forms as required or set for embedment as required, all miscellaneous metal items, sleeves, reglets, anchor bolts, inserts and other items furnished under other Sections and required to be cast into concrete.

1.02 RELATED WORK

- A. Concrete Reinforcement is included in Section 03200.
- B. Cast-in-Place Concrete is included in Section 03300.
- C. Lightweight Insulating Concrete is included in Section 03521.

1.03 REFERENCE STANDARDS

- A. American Concrete Institute (ACI)
 - 1. ACI 301 - Specifications for Structural Concrete for Buildings.
 - 2. ACI 318 - Building Code Requirements for Reinforced Concrete.
 - 3. ACI 347 - Formwork for Concrete.
- B. American Plywood Association (APA)
 - 1. Material grades and designations as specified.
- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.04 SYSTEM DESCRIPTION

- A. Structural design responsibility: All forms and shoring shall be designed at the CONTRACTOR's expense by an engineer meeting the licensing requirements for Vietnam and Da Nang. Formwork shall be designed and erected in accordance with the requirements of ACI 301 and ACI 318 and as recommended in ACI 347 and shall comply with all applicable regulations and codes. The design shall consider any special requirements due to the use of plasticized and/or retarded set concrete.

PART 2 PRODUCTS

2.01 GENERAL

- A. The usage of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configurations desired.

2.02 MATERIALS

- A. Forms for cast-in-place concrete shall be made of wood, metal, or other approved material. Wood forms for the project shall be new and unused. Construct wood forms of sound lumber or plywood of suitable dimensions and free from knotholes and loose knots. Where used for exposed surfaces, dress and match boards. Sand plywood smooth and fit adjacent panels with tight joints. Metal forms may be used when approved by the USAID COTR OR DESIGNATE and shall be of an appropriate type for the class of work involved. All forms shall be designed and constructed to provide a flat, uniform concrete surface requiring minimal finishing or repairs.
- B. Wall Forms
 - 1. Forms for all exposed exterior and interior concrete walls shall be new and unused "Plyform" exterior grade plywood panels manufactured in compliance with the APA and bearing the trademark of that group, or equal acceptable to the USAID COTR OR DESIGNATE. Provide B grade or better veneer on all faces to be placed against concrete during forming. The class of material and grades of interior plies shall be of sufficient strength and stiffness to provide a flat, uniform concrete surface requiring minimal finishing and grinding.
 - 2. All joints or gaps in forms shall be taped, gasketed, plugged, and/or caulked with an approved material so that the joint will remain watertight and will withstand placing pressures without bulging outward or creating surface patterns.
- C. Form Release Agent
 - 1. Coat all forming surfaces in contact with concrete using an effective, non-staining, non-residual, water based, bond-breaking form coating unless otherwise noted.
- D. Form Ties
 - 1. Form ties encased in concrete other than those specified in the following paragraphs shall be designed so that, after removal of the projecting part, no metal shall remain within 38 mm of the face of the concrete. The part of the tie to be removed shall be at least 12 mm in diameter or be provided with a wood or metal cone at least 12 mm diameter and 38 mm long. Form ties in concrete exposed to view shall be the cone-washer type.
 - 2. Form ties for exposed exterior and interior walls shall be as specified in the preceding paragraph except that the cones shall be of approved wood or plastic.

3. Flat bar ties for panel forms shall have plastic or rubber inserts having a minimum depth of 38 mm and sufficient dimensions to permit proper patching of the tie hole.
4. Common wire shall not be used for form ties.
5. Alternate form ties consisting of tapered through-bolts at least 25 mm in diameter at smallest end or through-bolts that utilize a removable tapered sleeve of the same minimum size may be used at the CONTRACTOR's option. Obtain USAID COTR OR DESIGNATE's acceptance of system and spacing of ties prior to ordering or purchase of forming. Clean, fill and seal form tie hole with non-shrink cement grout. The CONTRACTOR shall be responsible for watertightness of the form ties and any repairs needed.

PART 3 EXECUTION

3.01 GENERAL

- A. Forms shall be used for all cast-in-place concrete including sides of footings. Forms shall be constructed and placed so that the resulting concrete will be of the shape, lines, dimensions and appearance indicated on the Drawings.
- B. Forms for walls shall have removable panels at the bottom for cleaning, inspection and joint surface preparation. Forms for walls of considerable height shall have closable intermediate inspection ports. Tremies and hoppers for placing concrete shall be used to allow concrete inspection, prevent segregation and prevent the accumulation of hardened concrete on the forms above the fresh concrete.
- C. Molding, bevels, or other types of chamfer strips shall be placed to produce blockouts, rustications, or chamfers as shown on the Drawings or as specified herein. Chamfer strips shall be provided at horizontal and vertical projecting corners to produce a 20 mm chamfer. Rectangular or trapezoidal moldings shall be placed in locations requiring sealants where specified or shown on the Drawings. Sizes of moldings shall conform to the sealants manufacturer's recommendations.
- D. Forms shall be sufficiently rigid to withstand construction loads and vibration and to prevent displacement or sagging between supports. Construct forms so that the concrete will not be damaged by their removal. The CONTRACTOR shall be entirely responsible for the adequacy of the forming system.
- E. Before form material is re-used, all surfaces to be in contact with concrete shall be thoroughly cleaned, all damaged places repaired, all projecting nails withdrawn and all protrusions smoothed. Reuse of wooden forms for other than rough finish will be permitted only if a "like new" condition of the form is maintained.

3.02 FORM TOLERANCES

- A. Forms shall be surfaced, designed and constructed in accordance with the recommendations of ACI 347 and shall meet the following additional requirements for the specified finishes.

- B. Formed Surface Exposed to View: Edges of all form panels in contact with concrete shall be flush within 1 mm and forms for plane surfaces shall be such that the concrete will be plane within 2 mm in 1.5 m. Forms shall be tight to prevent the passage of mortar, water and grout. The maximum deviation of the finish wall surface at any point shall not exceed 6 mm from the intended surface as shown on the Drawings. Form panels shall be arranged symmetrically and in an orderly manner to minimize the number of seams.
- C. Formed surfaces not exposed to view or buried shall meet requirements of Class “C” Surface in ACI 347.
- D. Formed rough surfaces including mass concrete, pipe encasement, electrical duct encasement and other similar installations shall have no minimum requirements for surface smoothness and surface deflections. The overall dimensions of the concrete shall be plus or minus 25 mm.
- E. All smooth faces to be exposed to view shall have surface deflections limited to 1 mm at any point and the variation in wall deflection shall not exceed 2 mm per 1.5 m. The maximum deviation of the finished wall surface at any point shall not exceed 6 mm from the intended surface as shown on the Drawings. All textured faces, from lines, or rustications to be exposed to view shall be straight, plumb and true with a variation of no more than 12 mm in 3 m measured in any direction.

3.03 FORM PREPARATION

- A. Wood forms in contact with the concrete shall be coated with an effective release agent prior to form installation.
- B. Steel forms shall be thoroughly cleaned and mill scale and other ferrous deposits shall be sandblasted or otherwise removed from the contact surface for all forms, except those utilized for surfaces receiving a rough finish. All forms shall have the contact surfaces coated with a release agent.

3.04 REMOVAL OF FORMS

- A. The CONTRACTOR shall be responsible for all damage resulting from removal of forms. Forms and shoring for structural slabs or beams shall remain in place in accordance with ACI 301 and ACI 347. Form removal shall conform to the requirements specified in Section 03300.

3.05 INSPECTION

- A. The USAID COTR OR DESIGNATE shall be notified when the forms are complete and ready for inspection at least 6 hours prior to the proposed concrete placement.
- B. Failure of the forms to comply with the requirements specified herein or to produce concrete complying with requirements of this Section shall be grounds for rejection of that portion of the concrete work. Rejected work shall be repaired or replaced as directed by the USAID COTR OR DESIGNATE at no additional cost to the OWNER. Such

repair or replacement shall be subject to the requirements of this Section and approval of the USAID COTR OR DESIGNATE.

END OF SECTION

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SECTION 03200

CONCRETE REINFORCEMENT

PART 1 PRODUCTS

1.01 SCOPE OF WORK

- A. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals required and install all concrete reinforcement complete as shown on the Drawings and as specified herein.
- B. Furnish only all the deformed steel reinforcement required to be entirely built into the concrete masonry unit construction.

1.02 RELATED REQUIREMENTS

- A. The Contract Documents include, but are not limited to, the following related sections:
 - 1. Cast-in-place Concrete is included in Section 03300.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, shop drawings and product data showing materials of construction and details of installation for:
 - 1. Reinforcing steel. Placement drawings shall conform to the recommendations of ACI 315. All reinforcement in a concrete placement shall be included on a single placement drawing or cross referenced to the main pertinent placement drawing. This drawing shall include the additional reinforcement (around openings, at corners, etc.) shown on the standard detail sheets. Bars to have special coatings and/or to be of special steel or special yield strength are to be clearly identified.
 - 2. Bar bending details. The bars shall be referenced to the same identification marks shown on the placement drawings. Bars to have special coatings and/or to be of special steel or special yield strength are to be clearly identified.
- B. Submit Test Reports, in accordance with Section 01300, of each of the following items.
 - 1. Certified copy of mill test on each steel proposed for use showing the physical properties of the steel and the chemical analysis.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

2. ASTM A184 – Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
 3. ASTM A185 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 4. ASTM A497 - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
 5. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 6. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
- B. American Concrete Institute (ACI)
1. ACI 301 - Specifications for Structural Concrete for Buildings
 2. ACI 318 - Building Code Requirements for Reinforced Concrete
 3. SP-66 (ACI 315) - ACI Detailing Manual
- C. Concrete Reinforcing Steel Institute (CRSI)
1. Manual of Standard Practice
- D. American Welding Society (AWS)
1. AWS D1.4 Structural Welding Code - Reinforcing Steel
- E. Where reference is made to one of the above standards, the revision in effect at the time of the bid opening shall apply.

1.05 DELIVERY, HANDLING AND STORAGE

- A. Reinforcing steel shall be substantially free from mill scale, rust, dirt, grease, or other foreign matter.
- B. Reinforcing steel shall be shipped and stored with bars of the same size and shape fastened in bundles with durable tags, marked in a legible manner with waterproof markings showing the same "mark" designations as those shown on the submitted Placing Drawings.
- C. Reinforcing steel shall be stored off the ground, protected from moisture, and kept free from dirt, oil, or other injurious contaminants.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials shall be new, of domestic manufacture, and shall comply with the following material specifications.
- B. Deformed Concrete Reinforcing Bars: ASTM A615, Grade 60 deformed bars.
- C. Concrete Reinforcing Bars required on the Drawings to be Field Bent or Welded: ASTM A706.
- D. Welded Steel Wire Fabric: ASTM A185.
- E. Welded Deformed Steel Wire Fabric: ASTM A497.
- F. Welded Plain Bar Mats: ASTM A704 and ASTM A615 Grade 60 plain bars.
- G. Fabricated Deformed Steel Bar Mats: ASTM A184 and ASTM A615 Grade 60 deformed bars.
- H. The following alternate materials are allowed:
 - 1. ASTM A615 Grade 60 may be used for ASTM A706 provided the following requirements are satisfied:
 - a. The actual yield strength of the reinforcing steel based on mill tests shall not exceed the specified yield strength by more than 18,000 psi. Retests shall not exceed this value by more than an additional 3000 psi.
 - b. The ratio of the actual ultimate tensile strength to the actual tensile yield strength of the reinforcement shall not be less than 1.25.
 - c. The carbon equivalency (CE) of A615 bars shall be 0.55 or less.
- I. Reinforcing Steel Accessories
 - 1. Plastic Protected Bar Supports: CRSI Bar Support Specifications, Class 1 - Maximum Protection.
 - 2. Stainless Steel Protected Bar Supports: CRSI Bar Support Specifications, Class 2 - Moderate Protection.
 - 3. Precast Concrete Block Bar Supports: CRSI Bar Support Specifications, Precast Blocks.
- J. Tie Wire
 - 1. Tie Wires for Reinforcement shall be 16-gauge or heavier, black annealed wire.

2.02 FABRICATION

- A. Fabrication of reinforcement shall be in compliance with the CRSI.
- B. Bars shall be cold bent. Bars shall not be straightened or rebent.
- C. Bars shall be bent around a revolving collar having a diameter of not less than that recommended by the CRSI.
- D. Bar ends that are to be butt spliced, placed through limited diameter holes in metal, or threaded, shall have the applicable end(s) saw-cut. Such ends shall terminate in flat surfaces within 1-1/2 degrees of a right angle to the axis of the bar.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Surface condition, bending, spacing, and tolerances of placement of reinforcement shall comply with the CRSI. The CONTRACTOR shall be solely responsible for providing an adequate number of bars and maintaining the spacing and clearances shown on the Drawings.
- B. Except as otherwise indicated on the Drawings, the minimum concrete cover of reinforcement shall be as follows:
 - 1. Concrete cast against and permanently exposed to earth: 75-mm
 - 2. Concrete exposed to soil, water, sewage, sludge and/or weather: 50-mm
 - 3. Concrete not exposed to soil, water, sewage, sludge and/or weather:
 - a. Slabs (top and bottom cover), walls, joists, shells and folded plate members – 25-mm
 - b. Beams and columns (principal reinforcement, ties, spirals, and stirrups) – 38-mm
- C. Reinforcement which will be exposed for a considerable length of time after being placed shall be coated with a heavy coat of neat cement slurry.
- D. No reinforcing steel bars shall be welded either during fabrication or erection unless specifically shown on the Drawings or specified, or unless prior written approval has been obtained from the USAID COTR OR DESIGNATE. All bars that have been welded, including tack welds, without such approval shall be immediately removed from the work. When welding of reinforcement is approved or called for, it shall comply with AWS D1.4.
- E. Reinforcing steel interfering with the location of other reinforcing steel, conduits or embedded items may be moved within the specified tolerances or one bar diameter,

whichever is greater. Greater displacement of bars to avoid interference shall only be made with the approval of the USAID COTR OR DESIGNATE. Do not cut reinforcement to install inserts, conduits, mechanical openings or other items without the prior approval of the USAID COTR OR DESIGNATE.

- F. Securely support and tie reinforcing steel to prevent movement during concrete placement. Secure dowels in place before placing concrete.
- G. Reinforcing steel bars shall not be field bent except where shown on the Drawings or specifically authorized in writing by the USAID COTR OR DESIGNATE. If authorized, bars shall be cold-bent around the standard diameter spool specified in the CRSI. Do not heat bars. Closely inspect the reinforcing steel for breaks. If the reinforcing steel is damaged, replace, Cadweld or otherwise repair as directed by the USAID COTR OR DESIGNATE. Do not bend reinforcement after it is embedded in concrete unless specifically shown otherwise on the Drawings.

3.02 REINFORCEMENT AROUND OPENINGS

- A. Unless specific additional reinforcement around openings is shown on the Drawings, provide additional reinforcing steel on each side of the opening equivalent to one half of the cross-sectional area of the reinforcing steel interrupted by an opening. The bars shall have sufficient length to develop bond at each end beyond the opening or penetration.

3.03 SPLICING OF REINFORCEMENT

- A. Splices designated as compression splices on the Drawings, unless otherwise noted, shall be 30 bar diameters, but not less than 30-cm. The lap splice length for column vertical bars shall be based on the bar size in the column above.
- B. Tension lap splices shall be provided at all laps in compliance with the applicable tables in the ACI 315. Splices in adjacent bars shall be staggered. Class A splices shall be used when 50 percent or less of the bars are spliced within the required lap length. Class B splices shall be used at all other locations.
- C. Except as otherwise indicated on the Drawings, splices in circumferential reinforcement in circular walls shall be Class B tension splices and shall be staggered. Adjacent bars shall not be spliced within the required lap length.
- D. Install wire fabric in as long lengths as practicable. Splices in welded wire fabric shall be lapped in accordance with the requirements of ACI-318 but not less than 30-cm. The spliced fabrics shall be tied together with wire ties spaced not more than 60-cm on center and laced with wire of the same diameter as the welded wire fabric. Do not position laps midway between supporting beams, or directly over beams of continuous structures. Offset splices in adjacent widths to prevent continuous splices.

3.04 ACCESSORIES

- A. The CONTRACTOR shall be solely responsible for determining, providing and installing accessories such as chairs, chair bars, and the like in sufficient quantities and strength to

adequately support the reinforcement and prevent its displacement during the erection of the reinforcement and the placement of concrete.

- B. Use precast concrete blocks where the reinforcing steel is to be supported over soil.
- C. Stainless steel bar supports or steel chairs with stainless steel tips shall be used where the chairs are set on forms for a concrete surface that will be exposed to weather, high humidity, or liquid (including bottom of slabs over liquid containing areas). Use of galvanized or plastic tipped metal chairs is permissible in all other locations unless otherwise noted on the Drawings or specified.
- D. Alternate methods of supporting top steel in slabs, such as steel channels supported on the bottom steel or vertical reinforcing steel fastened to the bottom and top mats, may be used if approved by the USAID COTR OR DESIGNATE.

3.05 INSPECTION

- A. In no case shall any reinforcing steel be covered with concrete until the installation of the reinforcement, including the size, spacing and position of the reinforcement has been observed by the USAID COTR OR DESIGNATE and they have provided a release to proceed with the concreting has been obtained. The USAID COTR OR DESIGNATE shall be given ample prior notice of the readiness of placed reinforcement for observation. The forms shall be kept open until the USAID COTR OR DESIGNATE has finished his observations of the reinforcing steel.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required and install cast-in-place concrete complete as shown on the Drawings and as specified herein.
- B. Furnish, as required to establish concrete mixes, all sampling and laboratory testing of products and materials performed by an independent testing laboratory engaged by and at the expense of the CONTRACTOR.

1.02 RELATED WORK

- A. Concrete formwork is included in Section 03100.
- B. Concrete reinforcement is included in Section 03200.

1.03 SUBMITTALS

- A. Submit the following:
 - 1. Product data for reinforcement, forming accessories, admixtures, patching compounds, curing compounds, and others as requested by USAID COTR OR DESIGNATE.
 - 2. Shop drawings for fabricating, bending and placing concrete reinforcement.
 - 3. Laboratory test reports or evaluation reports for concrete materials and concrete mix designs.
 - 4. Written report to USAID COTR OR DESIGNATE for each proposed concrete mix at least 15 days prior to start of concreting. Do not begin concrete production until mixes have been reviewed by USAID COTR OR DESIGNATE.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 2. ASTM C33 - Standard Specification for Concrete Aggregates.
 - 3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

4. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
5. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
6. ASTM C138 – Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
7. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete
8. ASTM C150 - Standard Specification for Portland Cement
9. ASTM C156 - Standard Test Method for Water Retention by Liquid Membrane-Forming Curing Compound for Concrete
10. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete
11. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
12. ASTM C192 – Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
13. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
14. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
15. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
16. ASTM C311 - Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for use in Portland Cement Concrete.
17. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
18. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
19. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
20. ASTM C1260 - Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method).
21. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.

- B. American Concrete Institute (ACI).
 - 1. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
 - 2. ACI 232.2R - Use of Fly Ash in Concrete.
 - 3. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.
 - 4. ACI 304.2R - Placing Concrete by Pumping Methods.
 - 5. ACI 305R - Hot Weather Concreting.
 - 6. ACI 306R - Cold Weather Concreting.
 - 7. ACI 318 – Building Code Requirements for Structural Concrete and Commentary.
 - 8. ACI 350 - Code Requirements for Environmental Engineering Concrete Structures and Commentary.
- C. National Ready Mixed Concrete Association (NRMCA)
 - 1. Quality Control Manual, Section 3 - Certification of Ready Mixed Concrete Production Facilities.
- D. Truck Mixer Manufacturers Bureau (TMMB)
 - 1. TMMB 100 - Truck Mixer, Agitator and Front Discharge Concrete Carrier Standards.
- E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

1.06 DELIVERY AND STORAGE

- A. Comply with ACI 350 and other stated specifications, codes and standards. Apply the most stringent requirements of other stated specifications, codes, standards, and this Section when conflicts exist.
- B. Independent testing laboratory shall meet the requirements of ASTM E329 and ASTM C1077 and be acceptable to the Engineer. Laboratories affiliated with the CONTRACTOR or in which the CONTRACTOR or officers of the CONTRACTOR's organization have a beneficial interest are not acceptable.
- C. Use only one source of cement and aggregates for the project. Provide concrete uniform in color and appearance.

- D. At least ten working days before the first concrete placement hold a preconstruction meeting to review the requirements for concrete placement, waterstop placement, jointing, concrete curing, hot weather concreting, cold weather concreting and finishing. Review, with the attendance of the plasticizer manufacturer, the properties and techniques of batching and placing concrete containing high-range water-reducing admixture. Notify all parties involved, including the Engineer, of the meeting at least ten working days prior to its scheduled date. Prepare an agenda for the meeting. Take meeting minutes and distribute to all attendees.
- E. If, during the progress of the work, it is impossible to secure concrete of the specified workability and strength with the materials being furnished, the Engineer may order such changes in proportions or materials, or both, as may be necessary to secure the specified properties. Make all changes so ordered at no additional cost to USAID.
- F. If, during the progress of the work, the materials from the sources originally accepted change in characteristics, make, at no additional cost to USAID, new acceptance tests of materials and establish new concrete mixes with the assistance of an independent testing laboratory.
- G. All field testing and inspection services and related laboratory tests required will be provided by USAID. The cost of such work will be paid for by USAID. Methods of testing will comply with the latest applicable ASTM methods.
- H. Samples of constituents and of concrete as-placed will be subjected to laboratory tests by the USAID COTR OR DESIGNATE. All materials incorporated in the work shall conform to accepted samples.

1.07 DELIVERY AND STORAGE

- A. Cement: Store in weathertight buildings, bins or silos to provide protection from dampness and contamination and to prevent warehouse set.
- B. Aggregate: Arrange and use stockpiles to prevent segregation or contamination with other materials or with other sizes of like aggregates. Build stockpiles in successive horizontal layers not exceeding three feet in thickness. Complete each layer before the next is started. Do not use frozen or partially frozen aggregate.
- C. Sand: Arrange and use stockpiles to prevent contamination. Allow sand to drain to a uniform moisture content before using. Do not use frozen or partially frozen sand.
- D. Admixtures: Store in closed containers to prevent contamination, evaporation or damage. Provide agitating equipment to uniformly disperse ingredients in admixture solutions which tend to separate. Protect liquid admixtures from freezing and other temperature changes which could adversely affect their characteristics.
- E. Fly Ash: Store in weathertight buildings, bins or silos to provide protection from dampness and contamination.

- F. Sheet Curing Materials: Store in weathertight buildings or off the ground and under cover.
- G. Liquid Membrane Forming Curing Compounds: Store in closed containers.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150, Type 1.
- B. Fly Ash: ASTM C618, Type F.
- C. Aggregates: ASTM C33, local aggregates of proven durability may be used when acceptable to USAID COTR OR DESIGNATE.
- D. Water: Potable.

2.02 ADMIXTURES

- A. Provide admixtures that contain not more than 0.1 percent chloride ions.
 - 1. Air-Entraining Admixture: ASTM C260.
 - 2. Water-Reducing, Retarding, and Accelerating Chemical Admixtures: ASTM C494.

2.03 RELATED MATERIALS

- A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz per sq yd, complying with AASHTO M182, Class 2.
- B. Moisture-Retaining Cover: Waterproof paper, polyethylene film, or polyethylene-coated burlap, complying with ASTM C171.
- C. Membrane-Forming Curing Compound: ASTM C309, Type I. Moisture loss not more than 0.55 kg/sq meter when applied at 200 sq ft/gal.
- D. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.

2.04 MIX PROPORTIONS AND DESIGN

- A. Proportion mixes complying with mix design procedures specified in ACI 301.
 - 1. Limit use of fly ash to not exceed 25 percent of cement content by weight.
 - 2. Design mixes to provide normal weight concrete with the following properties:

- a. 3000 psi, 28 day compressive strength; water-cement ratio, 0.58 maximum (non-air-entrained), 0.46 maximum (air-entrained).
 3. Limit maximum water-cement ratio of concrete exposed to freezing and thawing to 0.45. Limit maximum water-cement ratio of concrete exposed to deicing salts, brackish water, or seawater to 0.40.
 4. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
 - a. Slabs: Not more than 75 mm.
 5. Adjust mix designs when material characteristics, job conditions, weather, test results, or other circumstances warrant. Do not use revised concrete mixes until laboratory test data and strength results have been submitted to and reviewed by USAID COTR OR DESIGNATE.
- B. Use air-entraining admixture in exterior exposed concrete, providing not less than 4.5 percent or more than 7 percent entrained air for concrete exposed to freezing and thawing and from 2 percent to 4 percent for other concrete.
- C. Use water-reducing, accelerating and retarding admixtures that have been tested and accepted in mix designs in strict compliance with MANUFACTURER's directions.

2.05 JOB-SITE MIXING

- A. Use drum-type batch machine mixer, mixing not less than 1-1/2 minutes for 1 cubic meter or smaller capacity. Increase mixing time at least 15 seconds for each additional cubic meter.
1. Ready-Mix Concrete: ASTM C94.

PART 3 EXECUTION

3.01 CONCRETE PLACEMENT

- A. Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," for placing concrete in a continuous operation within planned joints or sections. Do not begin concrete placement until other affected work is completed.
1. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping so that concrete is worked around reinforcement and other embedded items and into forms.
 2. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing and curing.
 - a. In cold weather comply with ACI 306.

- b. In hot weather comply with ACI 305.

3.02 FINISH OF FORMED SURFACE

- A. Smooth-Formed Finish: Provide a smooth finish for concrete surfaces exposed to view and surfaces to be covered with a coating or covering material applied directly to concrete. Repair and patch defective areas, with fins and other projections completely removed and smoothed.

3.03 MONOLITHIC SLAB FINISHES

- A. Nonslip Broom Finish: Apply nonslip broom finish to exterior concrete platforms, steps and ramps and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.04 CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry and windy weather, apply an evaporation control compound according to MANUFACTURER's instructions after screeding and bull floating, but before power floating and troweling.
 - 1. Begin initial curing as soon as free water has disappeared from exposed surfaces.
 - 2. Continue curing unformed concrete surfaces by water ponding, continuous fog spraying, continuously wetted absorptive cover, or by moisture-retaining cover curing. Cure formed surfaces by moist curing until forms are removed. Keep concrete continuously moist for not less than 72 hours for high-early strength concrete and 7 days for all other concrete.
 - 3. Apply membrane-forming curing compound to exposed interior slabs and to exterior slabs, walks and curbs as soon as final finishing operations are complete. Apply uniformly according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Use membrane-curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.

3.05 FIELD QUALITY CONTROL

- A. The CONTRACTOR will employ a testing agency to perform tests and to submit test reports. Sampling and testing for quality control during concrete placement may include the following, as directed by USAID COTR OR DESIGNATE.
 - 1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.

- a. Slump: ASTM C143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 - b. Air Content: ASTM C173, volumetric method for lightweight or normal weight concrete; ASTM C231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
 - c. Concrete Temperature: ASTM C1064; one test hourly when air temperature is 40 degrees F (4 degrees C) and below, when 80 degrees F (27 degrees C) and above and one test for each set of compressive-strength specimens.
 - d. Compression Test Specimen: ASTM C31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
 - e. Compressive-Strength Tests: ASTM C39; one set for each day's pour exceeding 5 cubic meters plus additional sets for each 50 cubic meters more than the first 25 cubic meters of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
 3. When total quantity of a given class of concrete is less than 50 cubic meters, USAID COTR OR DESIGNATE may waive strength testing if adequate evidence of satisfactory strength is provided.
 4. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
 5. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
 6. Test results will be reported in writing to USAID COTR OR DESIGNATE, ready-mix producer and CONTRACTOR within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength and type of break for both 7-day tests and 28-day tests.

3.06 NONDESTRUCTIVE TESTING

- A. Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

3.10 ADDITIONAL TESTS

- A. The CONTRACTOR will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by USAID COTR OR DESIGNATE. CONTRACTOR may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed.

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SECTION 03521

LIGHTWEIGHT INSULATING CONCRETE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals necessary and install and test lightweight insulating concrete as shown on the Drawings and as specified herein.
- B. Section includes cast-in-place perlite aggregate and cellular lightweight insulating concrete. This section also anticipates mixing of lightweight insulating concrete for the creation of pre-cast concrete insulating blocks, if selected as the perimeter system insulating material.

1.02 RELATED WORK

- A. Section 02610: Concrete Masonry Unit Containment Wall.
- B. Section 03100: Concrete Framework.
- C. Section 03200: Concrete Reinforcement.

1.03 SUBMITTALS

- A. Product data and proposed mix design for each type of product indicated.
- B. Laboratory test reports or evaluation reports for concrete materials and concrete mix designs.
- C. Written report to USAID COTR OR DESIGNATE for each proposed concrete mix at least 15 days prior to start of concreting. Do not begin concrete production until mixes have been reviewed by USAID COTR OR DESIGNATE.
- D. Shop Drawings: Include plans, sections, and details showing slopes, lightweight insulating concrete thicknesses, control and expansion joints, and drains.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 2. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

3. ASTM C138 - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
4. ASTM C150 – Standard Specification for Portland Cement
5. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete
6. ASTM C332 - Standard Specification for Lightweight Aggregates for Insulating Concrete
7. ASTM C495 - Standard Test Method for Compressive Strength of Lightweight Insulating Concrete
8. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation
9. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Concrete
10. ASTM C869 - Standard Terminology Relating to Clay Products

1.05 QUALITY ASSURANCE

- A. Inspection of the material will be made by the USAID COTR OR DESIGNATE. The material shall be subject to rejection at any time on account of failure to meet any of the requirements specified herein, even though material may have been accepted as satisfactory at the place of manufacture. Material rejected after delivery shall be marked for identification and shall immediately be removed from the job.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Cementitious Material: Portland cement, ASTM C150, Type I or Type III
- B. Lightweight Mineral Aggregate: ASTM C332, Group I, perlite.
- C. Foaming Agent: ASTM C869.
- D. Water: Clean, potable.
- E. Air-Entraining Admixture: ASTM C260.
- F. Joint Filler: ASTM C612, Class 2, glass-fiber type; compressing to one-half thickness under a load of 172 kPa (25 psi). Joint filler materials must be rated for continuous exposure to temperatures of up to 350°C (662°F).

- G. Steel Wire Mesh: Cold-drawn steel wire, galvanized, 1.04-mm (0.041-in) diameter, woven into 50-mm (2-in) hexagonal mesh, and reinforced with a longitudinal 1.57-mm (0.062-in) diameter wire spaced 75 mm (3 inches) apart.
- H. Fly Ash: Fly ash meeting ASTM C618, Class C or F, may be utilized to supplement a portion of the prescribed Portland cement content, upon approval of the proposed mix design by the USAID COTR OR DESIGNATE.

2.02 AGGREGATE LIGHTWEIGHT INSULATING CONCRETE

- A. Produce lightweight insulating concrete using the minimum amount of water necessary to produce a workable mix.
 - 1. Do not exceed maximum air content recommended by aggregate MANUFACTURER.
- B. Perlite Aggregate Mix: Lightweight insulating concrete produced from cementitious materials, water, air-entraining admixture, and perlite mineral aggregates. The perlite must be treated to MANUFACTURER's specifications to preclude water being absorbed into the aggregate grains. This step is necessary to ensure that the resulting concrete is waterproof and that the insulating properties of the perlite are not compromised through absorption of water.
 - 1. As-Cast Unit Weight: 640 to 750 kg/m³ (40-47 lb/cu. ft.) at point of placement, when tested according to ASTM C138/C138M.
 - 2. Oven-Dry Unit Weight: 430 to 530 kg/m³ (27-33 lb/cu. ft.), when tested according to ASTM C495.
 - 3. Compressive Strength: Minimum 1310 kPa (190 psi) when tested according to ASTM C495.
 - 4. Cement-to-Aggregate Ratio, by Volume 1:5.5.
 - 5. Expanded Perlite aggregate density: 130-190 kg/m³ (8-12 lb/cu. ft.)
 - 6. Air Entraining Admixture: Add air entraining agent in accordance with MANUFACTURER's written instructions.

2.03 CELLULAR LIGHTWEIGHT INSULATING CONCRETE

- A. Produce cellular lightweight insulating concrete with the following minimum physical properties using cementitious materials, air-producing liquid-foaming agents, and the minimum amount of water necessary to produce a workable mix.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Celcore Incorporated.
 - b. Cellular Concrete LLC, Mearlcrete Division.
 - c. Elastizell Corporation of America.
 - d. Lite-Crete Inc.
 - e. Siplast.
 - f. Others as approved by USAID COTR OR DESIGNATE.
2. As-Cast Unit Weight: 545 to 673 kg/m³ (34 to 42 lb/cu. ft) at point of placement, when tested according to ASTM C138/C138M.
 3. Oven-Dry Unit Weight: 416 to 513 kg/m³ (26 to 32 lb/cu. ft), when tested according to ASTM C495.
 4. Compressive Strength: Minimum 1310 kPa (190 psi), when tested according to ASTM C495.

PART 3 EXECUTION

3.01 PREPARATION

- A. Control Joints: Install control joints at perimeter of floor and at junctures with vertical surfaces including curbs, walls, and drains for full depth of lightweight insulating concrete. Full transverse control joints shall be placed at a frequency not less than every 30m (100ft). Fill control joints with recommended joint filler.
- B. Where wire mesh reinforcing is required to ensure stability and prevent cracking of the insulating concrete layer, it must be carried out in the following manner. Place steel wire mesh with longest dimension perpendicular to long axis of slab. Cut mesh to fit around drains, penetrations and projections. Terminate mesh at control joints. Lap sides and ends of mesh between adjacent panels at least 150 mm (6 in). Ensure that mesh is positioned at least 75 mm (3 inches) from top of bottom of concrete slab.

3.02 MIXING AND PLACING

- A. Mix and place lightweight insulating concrete according to MANUFACTURER's written instructions, using equipment and procedures to avoid segregation of mixture and loss of air content.
- B. For Perlite concrete, in general, the required amounts of water, air entraining admixture and Portland cement shall be placed in a drum mixer and mixed until a slurry is formed, then the proper quantity of waterproofered Perlite shall be added and mixed until the required wet density is reached. Mix Perlite slurry only as required to achieve even dispersion of Perlite materials to avoid damaging Perlite granules.

- C. Deposit and screed lightweight insulating concrete in a continuous operation until an entire panel or section is completed. Do not vibrate or work mix except for screeding or floating. Place to depths and slopes indicated.
- D. Finish top surface smooth, free of ridges and depressions, and maintain surface in condition to receive subsequent covering materials.
- E. Begin curing operations immediately after placement and air cure for not less than three days, according to MANUFACTURER's written instructions. Prevent lightweight insulating concrete from drying too rapidly. Allow lightweight insulating concrete to cure for 5 to 7 days before placing structural concrete slab over top. Protect freshly poured concrete from damage by heavy rain. If heavy rain occurs near the end of the curing period, an additional 1-2 days of dry weather cure time may be required.

3.03 FIELD QUALITY CONTROL

- A. The CONTRACTOR will employ a testing agency to perform tests and to submit test reports. Sampling and testing for quality control during concrete placement may include the following, as directed by USAID COTR OR DESIGNATE.
 - 1. Sampling Fresh Concrete: ASTM C172.
 - a. Concrete Temperature: ASTM C1064; one test hourly when air temperature is 40 degrees F (4 degrees C) and below, when 80 degrees F (27 degrees C) and above and one test for each set of compressive-strength specimens.
 - b. Compression Test Specimen: ASTM C31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
 - c. Compressive-Strength Tests: ASTM C39; one set for each day's pour exceeding 5 cubic meters plus additional sets for each 50 cubic meters more than the first 25 cubic meters of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
 - 2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
 - 3. When total quantity of a given class of concrete is less than 50 cubic meters, USAID COTR OR DESIGNATE may waive strength testing if adequate evidence of satisfactory strength is provided.

4. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
5. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
6. Test results will be reported in writing to USAID COTR OR DESIGNATE, ready-mix producer and CONTRACTOR within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength and type of break for both 7-day tests and 28-day tests.

3.04 NONDESTRUCTIVE TESTING

- A. Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

3.05 ADDITIONAL TESTS

- A. The CONTRACTOR will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by USAID COTR OR DESIGNATE. CONTRACTOR may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed.

END OF SECTION

SECTION 07210

IPTD THERMAL INSULATION

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals necessary and install IPTD thermal insulation as shown on the Drawings and as specified herein.
- B. The intent of the In-Pile Thermal Desorption (IPTD) pile insulation is to provide a thermal insulating barrier to minimize heat losses through the top, bottom, and sidewalls of the pile. The design intent is provide a minimum insulation $R = 5.28 \text{ m}^2\text{K/W}$ ($30.0 \text{ h}\cdot\text{ft}^2\cdot^\circ\text{F/Btu}$) (i.e., insulating R-value of $R=30$). Different insulation materials and installation methods may be used for the bottom and sidewalls as appropriate based on materials availability and installation configuration. Insulating materials must maintain their full functionality under high temperature, moisture content, and compressive pressure of the soil pile. The soils will be maintained under light vacuum during the heating process and a vapor barrier will be placed between the insulation and the treated soils.
- C. The soil pile will be created in lifts that will be compacted prior to the placement of the next lift. Placement of the insulation in the sidewalls should anticipate this mode of pile construction, and subsequent disassembly.
- D. This specification includes an approach for insulation of the side walls (e.g., foam glass) and the IPTD floor (i.e., air-entrained concrete containing perlite and/or other air entraining agents). Alternative insulation materials (e.g., crushed and sorted lava rock or sea shells) and installation approaches will be considered subject to demonstration of concept and warrantee that the components and the integrated system meet the required performance criteria.

1.02 RELATED WORK

- A. Lightweight Insulating Concrete: Section 03521

1.03 SUBMITTALS

- A. Product data: For each type of product to be utilized.
- B. Product test reports
- C. MANUFACTURERS' installation instructions
- D. Mix design and batch certification reports for concrete mixes

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM A328 - Standard Specification for Steel Sheet Piling
 - 2. ASTM C165 - Standard Test Method for Measuring Compressive Properties of Thermal Insulations
 - 3. ASTM C240 - Standard Test Methods of Testing Cellular Glass Insulation Block
 - 4. ASTM C303 - Standard Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation
 - 5. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation
 - 6. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials
- B. Japanese Industrial Standards (JIS)

1.05 QUALITY ASSURANCE

- A. Inspection of the material will be made by the USAID COTR OR DESIGNATE. The material shall be subject to rejection at any time on account of failure to meet any of the requirements specified herein, even though material may have been accepted as satisfactory at the place of manufacture. Material rejected after delivery shall be marked for identification and shall immediately be removed from the job.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Temperature Resistance Rating: Insulation materials must be rated for continuous exposure to temperatures of up to 350oC (662°F).
- B. Crush Resistance Rating: Insulation, or combination of insulation and insulation containment system must have a minimum compressive strength of 14,647 kg/m² (3,000 psf) (floor) and 14,647 kg/m² (3,000 psf) (walls).
- C. Moisture Resistance Rating: Insulation material shall not be absorbent and shall be designated as water resistant.
- D. Insulation Value: Insulation material must have an aggregate (total) installed insulating value equivalent to $R = 5.28 \text{ m}^2\text{K/W}$ (30.0 h-ft²·°F/Btu) (i.e., insulating value R-30). The insulation materials must achieve this insulation value within a thickness less than or equal to 60 cm (24 inches), so that the internal volume capacity of the treatment cell is not reduced.

2.02 MATERIALS

A. LOW DENSITY INSULATING CONCRETE (Floor & Wall Insulation Material)

1. Requirements:
 - a. Low-density, air-entrained insulating Portland cement concrete, as described in Specification Section 03521. Possible alternative: refractory cement.
 - b. Air entraining may be through air entrainment admixtures, foaming agents, or other suitable and approved measures.
 - c. Lightweight insulating concrete density shall be as specified in Section 03521.
 - d. Concrete shall be mixed with either perlite (see 2.02 C herein) or suitable air entraining admixtures to increase the insulation value.
 - e. Air-entrained concrete mixed with perlite is proposed as the insulating material for the floor of the IPTD pile. The insulating layer will be installed as part of a multi-layer concrete system to exclude water and provide for a stable working surface for soil loading and unloading
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Celcore Incorporated.
 - b. Cellular Concrete LLC, Mearlcrete Division.
 - c. Elastizell Corporation of America.
 - d. Lite-Crete Inc.
 - e. Siplast.
 - f. Others as approved by the USAID COTR OR DESIGNATE
3. Refer to Specification Section 03521 for additional requirements for lightweight concrete.

B. FOAM GLASS INSULATION (Wall Insulating Material)

1. Requirements:
 - a. Foam Glass Insulation Material
 - 1) Absorption of Moisture: 0.2% per ASTM C240

- 2) Water Vapor Permeability: 0.0%, per ASTM E96 Wet Cup Procedure B
 - 3) Composition: 100% Glass, no binder
 - 4) Compressive Strength: 620 kPa, per ASTM C165
 - 5) Density: 120-150 kg/m³ per ASTM C303
 - 6) Thermal Conductivity = 0.042 W/mK at 24 degrees C.
 - 7) Specific Heat: 0.84 kJ/kgK
 - 8) Maximum Service Temp: 430 degrees C
 - 9) Compliance to standards: ASTM C552 and JIS
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pittsburgh Corning.
 - b. Others as approved by the USAID COTR OR DESIGNATE.
 3. Foam Glass to meet ASTM C552, "Specification for Cellular Glass Thermal Insulation"

C. INTERLOCKING STEEL SHEET WALL PANELS (Vapor Barrier)

1. Requirements:
 - a. The section modulus of the sheet piling shall be no less than 145 cm³/m.
 - b. The moment of inertia of the sheet piling shall be no less than 724 cm⁴/m.
 - c. Thickness: Interlocking steel sheet used for vertical wall insulation vapor barrier shall consist of minimum thickness steel sheet with interlocking vertical joint.
 - 1) L Profile WRL 1.5, 3 mm thickness from WANZE sheet pile
 - d. The sheet piling must have a maximum section depth of 100 mm if 3 mm thickness is utilized or 150 mm if 4.5 mm thickness is utilized to prevent web buckling.
 - e. The sheet piling must have a minimum width of 700 mm per sheet

- f. The CONTRACTOR shall provide a written procedure detailing materials and methods for sealing the interlocking joints between adjacent sheet panels.
- g. The CONTRACTOR shall demonstrate proper support of the sheet pile to prevent crushing of the insulation under pressure from the soils.
- h. Submittals:
 - 1) Sheet pile specification sheets
 - 2) Shop Drawings
 - 3) Sealing material specification and installation plan
- 2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. MAFCO (Mid-America Foundation Supply, Inc.)
 - b. PPI (Piling Products, Inc.)
 - c. Richards Pipe & Steel.
 - d. Others as approved by USAID COTR OR DESIGNATE.
- 3. All sheet piling shall be manufactured entirely from Structural Steel: ASTM A 328/A 328M that meets or exceeds the characteristics listed in this specification.

PART 3 INSTALLATION

3.01 INSTALLATION OF BOARD INSULATION ON VERTICAL SURFACES

- A. On vertical surfaces, set insulation units according to MANUFACTURER's written instructions.
 - 1. Install board insulation on concrete wall substrate by adhesively attached, spindle-type insulation anchors as follows:
 - 2. Fasten insulation anchors to concrete substrate with insulation anchor adhesive according to anchor MANUFACTURER's written instructions. Space anchors according to insulation MANUFACTURER's written instructions for insulation type, thickness, and application indicated.
 - 3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.

4. Insulation boards will be installed from of the base of the concrete block wall to the top of the wall.
5. The insulating layer will be installed as part of a multi-layer board system to achieve proper insulation value.

3.02 INSTALLATION OF LOOSE INSULATION (MINERAL AGGREGATE) ON VERTICAL SURFACES

- A. On vertical surfaces, set insulation units according to MANUFACTURER's written instructions.
 1. Install poly liner loosely on concrete wall substrate by means of taped adhesive to allow for movement of blocks to avoid tears.
 2. Install the interlocking steel sheets and brace them in place by means of 7.5 cm x 7.5 cm x 0.6 cm (3" x 3" x 1/4") angle fastened to the top of concrete (base) and at the top by means of two (2) steel clips.
 3. After the internal steel sheet vapor barrier has been assembled, pour the mineral aggregate insulation into the void between the poly liner and steel sheet vapor barrier.
 - a. Loose fill insulation materials shall not be allowed to fall from a height greater than 1.5 m. Provide a placement chute or other suitable means to limit the falling height during placement of loose fill materials.
 4. The loose fill insulating material will be installed as part of a system to achieve proper insulation value

3.03 INSTALLATION OF INSULATION FOR LOW DENSITY CONCRETE BLOCKS

- A. Requirements
 1. Install poly liner loosely on concrete wall substrate by means of taped adhesive to allow for movement of blocks to avoid tears.
 2. Install the first row of low density concrete blocks along the entire perimeter. Check for level placement and for tight fit against poly liner.
 3. Continue installing each additional row of blocks checking for level and fit during placement and upon completion of each lift.
 4. Seal joints between adjacent lightweight concrete blocks with high temperature grout.
 5. The low density concrete blocks are installed as part of a system to achieve proper insulation value

3.04 INSTALLATION OF INTERLOCKING STEEL SHEET VAPOR BARRIER

- A. General: Assemble interlocking steel sheets according to MANUFACTURER's written instructions in orientation, sizes, and locations indicated on Drawings. Install sheets according to design drawings. Each steel sheet shall be installed plumb and perpendicular to (90 degrees) to the top of concrete floor. Anchor steel sheets and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Commence interlocking steel sheet vapor barrier installation.
 2. Shim or otherwise plumb substrates receiving steel sheet panels.
 3. Flash and seal metal plate wall panels with weather closures at perimeter of all openings. Do not begin installation until weather barrier and flashings that will be concealed by panels are installed.
 4. Install flashing and trim as metal plate wall panel installation work proceeds.
 5. Provide weather tight escutcheons for pipe and conduit penetrating exterior walls.
 - a. Fasteners:
 - 1) Use carbon-steel fasteners
 - b. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by steel sheet wall panel manufacturer.
 - c. Attachment System, General: Install attachment system required to support steel sheet wall panels and to provide a complete vapor tight wall system, including subgirts, stand-offs, MANUFACTURER's extrusions, flashings and trim.
 - 1) Include attachment to supports and extrusion trim at dissimilar-materials
 - 2) Do not apply sealants to joints unless otherwise indicated on Drawings or MANUFACTURER's Shop Drawings.
 6. Installation Tolerances: Shim and align metal plate wall panel units within installed tolerance of 6.3 mm (1/4 inch) horizontal variance in 6.5 m (21.3 ft) vertical panel height, non-cumulative, on level, plumb, and location lines as indicated.

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US Agency for International Development

1300 Pennsylvania Avenue, NW

Washington, DC 20523

Tel: (202) 712-0000

Fax: (202) 216-3524

www.usaid.gov