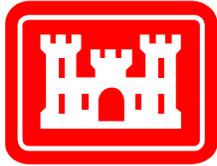


**Memphis District**

**Invitation for Bid No. W912EQ-04-B-0007**



**US Army Corps  
of Engineers®**

**Project Title:**

**PECAN POINT RELIEF WELLS**

**Location:**

**MISSISSIPPI COUNTY, ARKANSAS**

**Construction Solicitation  
and Specifications**

**THIS PROJECT IS LIMITED TO 8(A) ELIGIBLES IN THE FOLLOWING  
STATES: ARKANSAS, LOUISIANA, OKLAHOMA, NEW MEXICO AND  
TEXAS**

**Date: June 2004**

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SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 LUMP SUM PAYMENT ITEMS

1.1.1 General

Payment items for the work of this contract for which contract lump sum payments will be made are listed in the BIDDING SCHEDULE and described below. All costs for items of work, which are not specifically mentioned to be included in a particular lump sum or unit price payment item, shall be included in the listed lump sum item most closely associated with the work involved. The lump sum price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, meeting safety requirements, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

1.1.2 Lump Sum Items

(1) "Mobilization and Demobilization"

a. Payment

Payment will be made for all costs associated with operations necessary for mobilization and demobilization as specified in Section 00700 DFARS 252.236-7004.

b. Unit of measure, lump sum: LS.

(2) "Clearing"

a. Payment

Payment will be made for costs associated with operations necessary for clearing as specified in SECTION 02114.

b. Unit of measure, lump sum: LS.

(3) “Establishment of Turf”

a. Payment

Payment for fertilizing and seeding will be made at the contract lump sum for “Fertilizing and Seeding”, which price and payment shall constitute full compensation for preparation of ground surfaces, furnishing and distributing fertilizer; and performing all operations incidental thereto, all as specified in SECTION 02936. No payment for fertilizing and seeding will be made until acceptance by the Contracting Officer or his/her representative.

b. Unit of measure, lump sum: LS.

(4) “Aggregate Surfacing”

a. Payment

Payment for aggregate resurfacing will be made at the contract lump sum price for “Roadway Resurfacing”, which price and payment shall constitute full compensation for furnishing all material and equipment and performing all labor for replacing aggregate surfacing and all other operations incidental thereto; all as specified in SECTION 02546 – AGGREGATE SURFACING.

b. Unit of measure; lump sum: LS.

(5) “Environmental Protection”

a. Payment

Payment will be made for costs associated with operations necessary for environmental protection as specified in SECTION 01130 and the SWPPP.

b. Unit of measure, lump sum: LS.

1.2 UNIT PRICE PAYMENT ITEMS

1.2.1 Unit Price Items

(1) “Excavation”

a. Measurement

A survey of the site for excavation of the ditch in the vicinity of the relief wells will be made in accordance with the **SPECIAL CONTRACT REQUIREMENTS** entitled “Quantity Surveys- Alternate I,” and all measurement of excavation will be based on this survey. The quantity of ditch excavation to be paid for will be computed between the ground surface, as determined by the above noted surveys, and the theoretical slope lines and grade lines for such excavation as indicated on the drawings and/or specified herein. No allowance will be made for over-depth excavation, and for the removal of any material outside the required side slope lines.

b. Payment

Payment for excavation, measures as prescribed hereinabove, will be made at the applicable contract unit price per cubic yard for “Excavation”, which price and payment shall constitute full compensation for furnishing all materials and equipment and performing all labor for excavation for ditch in the vicinity of the relief wells; disposal of excavated material; and all other operations incidental thereto as specified in SECTION 02225.

c. Unit of Measure, cubic yard: CY

(2) “Relief Wells (8 inch)”

a. Measurement

Relief wells will be measured for payment by the linear foot of completed well between the ground surface and the elevation at the bottom of the well screen.

b. Payment

Payment for relief wells will be made at the applicable contract unit price, per linear foot, for “Relief Wells (8 inch)”, which price shall constitute full compensation for construction of relief wells all as specified in SECTION 02708. Wells ordered abandoned by the Contracting Officer before installation of well screen and riser, due to no fault of the Contractor, will be paid for at 50 percent of the applicable contract unit price per linear foot, for “Relief Wells (8 inch)”. Wells ordered abandoned by the Contracting Officer after installation of well screen and casing, due to no fault of the Contractor, will be paid for at the full applicable contract unit price for “Relief Wells (8 inch)”. No payment will be made for placement or replacement of temporary drilling casings or repair of damage resulting from Contractor operations. No separate payment will be made for relief well screen, risers, gravel pack, grout, development, sand and concrete backfill, discharge or outlet discharge assembly. No payment will be made for any wells or drilled holes that, in the opinion of the Contracting Officer, are abandoned due to Contractor fault or neglect.

c. Unit of measure, linear foot: LF.

(3) "Pumping Test"

a. Measurement

Pumping tests will be measured for payment for each hour, measured to the nearest 15 minutes, of pumping test successfully performed as specified in SECTION 02708, and as otherwise directed by the Contracting Officer. Testing time will not include time required to place and remove testing and pumping equipment.

b. Payment

Payment for pumping test will be made at the applicable contract unit price per hour for "Pumping Test: 0005AA First 174 Hours" or "Pumping Test: 0005AB All over 174 Hours", which price and payment shall constitute full compensation for performing satisfactory pumping tests as specified in SECTION 02708. No payment will be made for pumping tests not successfully completed.

c. Unit of measure, hour: HR

(4) "Pilot Hole Boring"

a. Measurement

Pilot hole borings will be measured for payment by the linear foot of completed pilot hole between the ground surface and the specified bottom of the pilot hole boring as specified in SECTION 02708.

b. Payment

Payment will be made at the contract unit price per linear foot for "Pilot Hole Boring", which price and payment shall constitute full compensation for drilling of the pilot hole borings, taking of samples, sieve analysis tests, and the maintaining of a field boring log as specified in SECTION 02708.

c. Unit of Measure, linear foot: LF.

(5) "Guard Posts"

a. Measurement

Measurement shall be per each guard post.

b. Payment

Payment for well guard posts will be made at the contract unit price per each for “Guard Posts” which price and payment shall constitute full compensation for furnishing all plant, labor, material including concrete, and equipment for performing all operations necessary to constitute and install the guard posts as shown on the drawings and/or specified in paragraph 3.3 in SECTION 02708.

c. Unit of measure, each: EA

(6) “Corrugated Metal Pipe,48-inch”

a. Measurement

The culverts will be measured for payment by the linear foot. Such measurement will be made in the field and will be based on the length installed as determined and approved by the Contracting Officer.

b. Payment

Payment for the culverts will be made at the unit price per linear foot for “Corrugated Metal Pipe, 48-inch”, which price and payment shall constitute full compensation for furnishing and installing the culvert; incidental excavation required for the installation of the new culvert; furnishing and placement of geotextile material; backfilling around and over the culvert; furnishing and placement of aggregate surfacing material, and all other operations incidental thereto; all as specified in Section 02700.

c. Unit of measure, linear feet: LF.

(7) “Riprap R 90”

a. Measurement

If the riprap material is delivered by railroad, weights as acceptable to the railroad for freight charge purposes will be accepted as measurement of the riprap material. Copies of freight bills or certifications of weights acceptable to the railroad for freight charge purposes shall be furnished. If not delivered by railroad, but delivered by truck, the riprap material will be measured for payment, in the presence of a Government Inspector unless waived by the Contracting Officer, by being weighed on approved, accurately calibrated scales furnished by and at the expense of the Contractor.

Weight certificates furnished by a public weighmaster where available will be acceptable in lieu of such procedure when authorized by the Contracting Officer. Individual weight tickets shall be furnished the Government Inspector at the time of delivery.

b. Payment

Payment for riprap will be made at the applicable contract unit price per ton for "Riprap R 90", which price and payment shall include all costs of furnishing, hauling, handling, placement, and maintaining the riprap; all as specified in SECTION 02542- STONE PROTECTION.

a. Unit of measure, ton: TN

(8) "Riprap R 200"

a. Measurement

If the riprap material is delivered by railroad, weights as acceptable to the railroad for freight charge purposes will be accepted as measurement of the riprap material. Copies of freight bills or certifications of weights acceptable to the railroad for freight charge purposes shall be furnished. If not delivered by railroad, but delivered by truck, the riprap material will be measured for payment, in the presence of a Government Inspector unless waived by the Contracting Officer, by being weighed on approved, accurately calibrated scales furnished by and at the expense of the Contractor.

Weight certificates furnished by a public weighmaster where available will be acceptable in lieu of such procedure when authorized by the Contracting Officer. Individual weight tickets shall be furnished the Government Inspector at the time of delivery.

b. Payment

Payment for riprap will be made at the applicable contract unit price per ton for "Riprap R 200", which price and payment shall include all costs of furnishing, hauling, handling, placement, and maintaining the riprap; all as specified in SECTION 02542- STONE PROTECTION.

b. Unit of measure, ton: TN

(9) "Geotextile"

a. Measurement

Measurement shall be by the square yard.

b. Payment

Payment shall be made at the contract unit price per square feet for "Geotextile" which price and payment shall constitute full compensation to the Contractor for providing all plant, labor, material,

and equipment and performing all operations necessary for the complete and satisfactory installation of the geotextile. Payment for the items listed below is included in the contract unit price for "Geotextile" and shall not be counted a second time in the process of determining the extent of geotextile placed:

- (1) Material and associated equipment and operation used in laps, seams, or extra length;
- (2) Securing pins and associated material, equipment, and operations;

No payment shall be made for geotextiles replaced because of contamination or damage due to Contractor fault or negligence.

c. Unit of measure, square feet: SY.

PART 2 PRODUCTS (Not Used)

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**SECTION 01130**

**ENVIRONMENTAL PROTECTION**

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**SECTION 01130**

**ENVIRONMENTAL PROTECTION**

**PART 1 GENERAL**

**1.1 DEFINITIONS**

For the purpose of this specification, environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic, cultural and/or historical purposes. The control of environmental pollution and damage requires consideration of air, water, and land, and includes management of visual aesthetics, noise, solid waste, radiant energy and radioactive materials, as well as other pollutants.

**1.2 ENVIRONMENTAL PROTECTION REQUIREMENTS**

Provide and maintain, during the life of the contract, environmental protection. Plan for and provide environmental protective measures to control pollution that develops during normal construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Comply with Federal, State, and Local regulations pertaining to the environment, including but not limited to water, air, and noise pollution.

**1.2.1 Environmental Protection Plan**

Within 15 days after receipt of Notice of Award of the contract, the Contractor shall submit, in writing, an Environmental Protection Plan. Prior to starting work, the Contractor shall meet with representatives of the Contracting Officer to develop mutual understanding relative to compliance with this provision and administration of the environmental protection program. Approval of the Contractor's plan will not relieve the Contractor of his/her responsibility for adequate and continuing control of pollutants and other environmental protection measures. The Government reserves the right to make changes in his/her environmental protection plan and operations as necessary to maintain satisfactory environmental protection performance. The Environmental Protection Plan shall include but not be limited to the following:

#### 1.2.1.1 Protection of Features

The Contractor shall determine methods for the protection of features to be preserved within authorized work areas. The Contractor shall prepare a listing of methods to protect resources needing protection, i.e., trees, shrubs, vines, grasses and ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, archaeological and cultural resources.

#### 1.2.1.2 Procedures

The Contractor shall implement procedures to provide the required environmental protection and to comply with the applicable laws and regulations. The Contractor shall set out the procedures to be followed to correct pollution of the environment due to accident, natural causes or failure to follow the procedures set out in accordance with the Environmental Protection Plan.

#### 1.2.1.3 Permit or License

The Contractor shall obtain all needed permits or licenses.

#### 1.2.1.4 Drawings

The Contractor shall include drawings showing locations of any proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, stockpiles of earth materials, and disposal areas for excess earth material and unsatisfactory earth materials.

#### 1.2.1.5 Environmental Monitoring Plans

The Contractor shall include environmental monitoring plans for the jobsite which incorporate land, water, air and noise monitoring.

#### 1.2.1.6 Traffic Control Plan

The Contractor shall include a traffic control plan for the jobsite.

#### 1.2.1.7 Surface and Ground Water

The Contractor shall establish methods of protecting surface and ground water during construction activities.

#### 1.2.1.8 Work Area Plan

The Contractor shall include a work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. The plan shall include measures for marking the limits of use areas.

### 1.3 SUBCONTRACTORS

Assurance of compliance with this section by subcontractors will be the responsibility of the Contractor.

### 1.4 REGULATORY REQUIREMENTS

The Contractor shall comply with all State regulatory and statutory requirements.

#### 1.4.1 Permits

This section supplements the Contractor's responsibility under the contract clause PERMITS AND RESPONSIBILITIES to the extent that the Government has already obtained some environmental permits. The Government has obtained permits for erosion control (SWPPP) and water quality certification for deposition into wetlands (Section 404). The Contractor shall comply with the terms and conditions of these permits. These conditions have been incorporated into these specifications. The Contractor shall obtain all other needed permits or licenses.

## PART 2 PRODUCTS (Not Applicable)

## PART 3 EXECUTION

### 3.1 PROTECTION OF ENVIRONMENTAL RESOURCES

The environmental resources within the project boundaries and those affected outside the limits of permanent work under this contract shall be protected during the entire period of this contract. The Contractor shall confine his/her activities to areas defined by the contract drawings or specifications. Environmental protection shall be as stated in the following subparagraphs.

#### 3.1.1 Protection of Land Resources

Prior to the beginning of any construction, the Contracting Officer will identify all land resources to be preserved within the Contractor's work area. The Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without special permission from the Contracting Officer.

No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. Where such special emergency use is permitted, the Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs.

##### 3.1.1.1 Work Area Limits

Prior to any construction, the Contractor shall mark the areas where no work is to be performed under this contract. Isolated areas within the general work area

which are to be saved and protected shall also be marked or fenced. Monuments and markers shall be protected before construction operations commence and during all construction operations. Where construction operations are to be conducted during darkness, the markers shall be visible during darkness. This contract, however, does not allow nighttime work. The Contractor shall convey to his/her personnel the purpose of marking and/or protection of all necessary objects.

#### 3.1.1.2 Protection of Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features to be preserved, indicated and defined on the drawings submitted by the Contractor as a part of the Environmental Protection Plan, shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques.

#### 3.1.1.3 Reduction of Exposure of Unprotected Erodible Soils

Earthwork brought to final grade shall be finished as indicated and specified. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils. Except in instances where the constructed feature obscures borrow areas, quarries and waste material areas; these areas shall not initially be cleared in total. Clearing of such areas shall progress in reasonably sized increments as needed to use the areas as approved by the Contracting Officer.

#### 3.1.1.4 Temporary Protection of Disturbed Areas

Such methods as necessary shall be utilized to effectively prevent erosion and control sedimentation, including but not limited to the following:

##### Retardation and Control of Runoff

Runoff from the construction site shall be controlled by construction of diversion ditches, benches, and berms to retard and divert runoff to protected drainage courses, and the Contractor shall also utilize any measures required by area-wide plans approved under Paragraph 208 of the Clean Water Act.

#### 3.1.1.5 Erosion and Sedimentation Control Devices

The Contractor shall construct or install all temporary and permanent erosion sedimentation control features. Temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basin, grassing and mulching shall be maintained until permanent drainage and erosion control facilities are completed and operable.

#### 3.1.1.6 Location of Contractor Facilities

The Contractor's field offices, staging areas, stockpiles, storage, and temporary buildings shall be placed in areas approved by the Contracting Officer. Temporary movement or relocation of Contractor facilities shall be made only on approval by the Contracting Officer.

#### 3.1.1.7 Borrow Areas Provided by the Government

Borrow areas provided by the Government shall be managed to minimize erosion and to prevent sediment from entering nearby water courses or lakes.

#### 3.1.1.8 Disposal Areas

There are no disposal areas designated for this contract. All debris shall either be removed from the site of the work, or shall be disposed of by burning. See SECTION 02114 with regard to the disposal of cleared debris. Compliance with all Federal, State, and Local laws and ordinances is compulsory.

#### 3.1.1.9 Temporary Excavation and Embankments

Temporary excavation and embankments shall be controlled to protect adjacent areas from contamination.

#### 3.1.1.10 Disposal of Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers, which are emptied on a regular schedule. All handling and disposal shall be conducted to prevent contamination. The Contractor shall transport all solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal.

#### 3.1.1.11 Disposal of Chemical Wastes

Chemical wastes shall be stored in corrosion resistant containers, removed from the work area and disposed of in accordance with Federal, State, and Local regulations.

#### 3.1.1.12 Disposal of Discarded Materials

Discarded materials, other than those that can be included in the solid waste category, shall be handled as directed by the Contracting Officer.

### 3.2 HISTORICAL, ARCHAEOLOGICAL AND CULTURAL RESOURCES

Existing historical, archaeological and cultural resources within the Contractor's work area will be so designated by the Contracting Officer and precautions shall be taken by the Contractor to preserve all such resources, as they existed at the time they were pointed-out to the Contractor. The Contractor shall install all protection for these resources so designated on the contract drawings and shall be responsible for their preservation during this contract. If during construction items of apparent archaeological or historical interest are discovered, they shall be left undisturbed and the Contractor shall report the find immediately to the Contracting Officer.

### 3.3 PROTECTION OF WATER RESOURCES

The Contractor shall keep construction activities under surveillance, management and control to avoid pollution of surface and ground waters. Special management techniques as set out below shall be implemented to control water pollution by the listed construction activities, which are included in this contract.

#### 3.3.1 Cofferdam and Diversion Operations

The Contractor shall plan his/her operations and perform all work necessary to minimize adverse impact or violation of the water quality standard. Construction operations for dewatering, removal of cofferdams, tailrace excavation, and tunnel closure shall be controlled at all times to limit impact of water turbidity on the habitat for wildlife and impacts on water quality for downstream use.

#### 3.3.2 Stream Crossings

Stream crossings shall be controlled during construction. Crossings shall not violate water pollution control standards of the Federal, State or Local government.

#### 3.3.3 Monitoring of Water Areas Affected by Construction Activities

Monitoring of water areas affected by construction activities shall be the responsibility of the Contractor. The Contractor shall monitor all water areas affected by construction activities.

### 3.4 PROTECTION OF FISH AND WILDLIFE RESOURCES

The Contractor shall keep construction activities under surveillance, management and control to minimize interference with, disturbance to and damage of fish and wildlife. The Contractor, prior to beginning of construction operations, shall list species that require specific attention on his/her Environmental Protection Plan, along with measures for their protection.

### 3.5 PROTECTION OF AIR RESOURCES

The Contractor shall keep construction activities under surveillance, management and control to minimize pollution of air resources. All activities, equipment, processes, and work operated or performed by the Contractor in accomplishing the specified construction shall be in strict accordance with the laws of the State or States in which the work is being performed and all Federal emission and performance laws and standards. Special management techniques as set out below shall be implemented to control air pollution by the construction activities, which are included in the contract. In the event that air pollution occurs due to the Contractors actions, the Contractor shall take all necessary steps to rectify the situation to the satisfaction of the Contracting Officer.

#### 3.5.1 Particulates

Dust particles, aerosols, gaseous by-products from all construction activities, processing and preparation of materials, such as from asphaltic batch plants, shall be controlled at all times, including weekends, holidays and hours when work is not in progress. The Contractor shall maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, areas of excess excavated material disposal areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause the air pollution standards mentioned in the paragraph "PROTECTION OF AIR RESOURCES" to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated at such intervals as to keep the disturbed area damp at all times. The Contractor must have sufficient equipment available to accomplish this task. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs.

#### 3.5.2 Hydrocarbons and Carbon Monoxide

Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal, State, and/or Local allowable limits at all times.

#### 3.5.3 Odors

Odors shall be controlled at all times for all construction activities, processing and preparation of materials.

#### 3.5.4 Monitoring Air Quality

Monitoring of air quality shall be the responsibility of the Contractor. The Contractor shall monitor all air areas affected by the construction activities.

### 3.6 INSPECTION

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with the Contractor's Environmental Protection Plan. The Contractor shall, after receipt of such notice, inform the Contracting Officer of proposed corrective actions and take such actions as may be approved. If the Contractor fails to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective actions have been taken. No time extensions will be granted or costs or damages allowed to the Contractor for any such suspension.

### 3.7 POST CONSTRUCTION CLEANUP

The Contractor shall clean up all area(s) used for construction.

### 3.8 RESTORATION OF LANDSCAPE DAMAGE

The Contractor shall restore all landscape features damaged or destroyed during construction operations both inside and outside of the limits of the approved work areas. Such restoration shall be in accordance with the plans submitted for approval by the Contracting Officer.

### 3.9 MAINTENANCE OF POLLUTION FACILITIES

The Contractor shall maintain all constructed facilities and temporary pollution control devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

### 3.10 TRAINING OF CONTRACTOR PERSONNEL IN POLLUTION CONTROL

The Contractor shall train his/her personnel in all phases of environmental protection. The training shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, and installation and care of facilities (vegetative covers and instruments required for monitoring purposes) to insure adequate and continuous environmental pollution control.

### 3.11 REPORTING OF POLLUTION SPILLS

In the event that an oil spill or chemical release occurs during the performance of this contract, the Contractor is required to contact the National Response Center, telephone number 1-800-424-8802 as soon as possible, or if telephone communication is not possible, the nearest Arkansas Dept of Environmental Quality office may be contacted by radio to report the spill, (33 CFR 153.203). The Contractor shall comply with any instructions from the responding agency concerning containment and/or cleanup of spills.

**-- End of Section --**

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01330

SUBMITTAL PROCEDURES

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SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUBMITTAL CLASSIFICATION

Submittals are identified with submittal description (SD) numbers and are classified as follows:

1.1.1 Government Approved

Governmental approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

These items are tagged GA/AE or GA/RE in the submittal register.

The designer of record approves GA/AE review materials. This is usually an architectural-engineering design firm hired by the construction contractor. The Corps of Engineers construction resident engineer approves GA/RE review materials. This is usually a group of engineers who work for the installation's resident engineer.

1.1.2 For Information Only (FIO)

All submittals not requiring Government approval will be for information only. These items are tagged FIO in the submittal register. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.2 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory.

Approval will not relieve the Contractor of the responsibility for any error, which may exist, as the Contractor under the CQC requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work.

After submittals have been approved by the Contracting Officer, no re-submittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

### 1.3 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal.

If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

### 1.4 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

## PART 2 PRODUCTS (NOT APPLICABLE)

## PART 3 EXECUTION

### 3.1 GENERAL

The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements.

Prior to submittal, all items {GA and FIO} shall be checked and approved by the Contractor's Quality Control (CQC) representative and each item shall be stamped, signed, and dated by the CQC representative indicating action taken.

Proposed deviations from the contract requirements shall be clearly identified.

Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals.

Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby.

Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

### 3.2 SUBMITTAL REGISTER (ENG FORM 4288)

At the end of this section is one set of ENG Form 4288 listing items of equipment and materials for which submittals are required by the specifications; this list may not be all-inclusive and additional submittals may be required.

The Contractor will also be given the submittal register as a diskette containing the computerized ENG Form 4288 and instructions on the use of the diskette. Columns "d" through "r" have been completed by the Government; the Contractor shall complete columns "a" and "s" through "u" and submit the forms (hard copy plus associated electronic file) to the Contracting Officer for approval within 30 calendar days after Notice to Proceed.

The Contractor shall keep this diskette up-to-date and shall submit it to the Government together with the monthly payment request. The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract. The submittal register and the progress schedules shall be coordinated.

### 3.3 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently.

All submittals for all interior finishes (wall, floor, ceiling), all base, casework, toilet partitions, window treatments and all other similar items requiring coordinated color selection shall be submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled.

The contractor shall allow 30 calendar days, exclusive of mailing time, and this period shown on the submittal register and NAS schedule for submittals requiring Government review and approval.

No delay damages or time extensions will be allowed for time lost in late submittals or resubmittals.

An additional 10 calendar days shall be allowed and shown on the register and NAS schedule for the review and approval of submittals for food service equipment and refrigeration and HVAC control systems.

### 3.4 TRANSMITTAL FORM (ENG FORM 4025)

The sample transmittal form (ENG Form 4025) attached to this section shall be used for submitting both Government approved and for information only submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted.

Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

### 3.5 SUBMITTAL PROCEDURE

Submittals shall be made as follows:

#### 3.5.1 Procedures

The Contractor shall be responsible for the scheduling and control of all submittals.

The Contractor is responsible for confirming that the submittal register includes all submittals required by the contract documents.

In addition to those items listed on ENG Form 4288, the Contractor will furnish submittals for any deviation from the plans or specifications. The scheduled need dates must be recorded on the document for each item for control purposes and critical items must be tied to the contractor's approved schedule where applicable.

The Contractor will submit to the Contracting Officer for approval five (5) copies of all G/AE or G/RE level and for all FIO level submittals. This number of copies of submittals specified in this portion of the contract shall be as specified in lieu of the number as specified by FAR 52.236-21.

For those contracts requiring project schedule--Network Analysis System (NAS), the Contractor will schedule on the NAS, critical or key items of material or equipment which the procurement activities will, or have the potential to, significantly impact project critical path and completion. The list of key or critical items of material or equipment shall be submittal approved by the Contracting Officer. See attachment to Section 0800 for NAS scheduling requirements.

Where ENG Form 4025 must be submitted prior to approval of the Construction Progress Schedule, the Contractor shall submit an initial annotated ENG Form 4288 upon which dates for submittal, approval and delivery of procurement items shall be included for the first 60 days of the work.

Upon approval of the Construction Progress Schedule, or no later than 60 days after Notice to Proceed, the Contractor shall submit final annotated copies of ENG Form 4288-Submittal Register. Dates shall be coordinated with the approved Construction Progress Schedule to logically interface with the sequence of construction. Critical item numbers will be shown on the listing if NAS is required.

Furnishing the schedule shall not be interpreted as relieving the Contractor of his obligation to comply with all the specification requirements for the items on the schedule.

Contractor's Quality Control representative shall review the listing at least every 30 days and take appropriate action to maintain an effective system.

The Contractor shall furnish a list each 30 days of all submittals on which either Government's or Contractor's action is past due. This monthly list of delayed items shall also be annotated by the Contractor to show what corrective action he is taking with regard to slippages in submittal schedule that are attributable to actions by him, his subcontractors, or suppliers.

The Contractor shall provide updated submittal register data, electronically or on floppy disk, to the contracting Officer, monthly, indicating the current status and codes of all submittals in order update the master submittal register maintained by the Contracting Officer and to assure that the contractor's schedule is being maintained.

He shall also furnish revised due dates in those cases when the original submittal schedule is no longer realistic.

The Contractor shall certify that each submittal is correct and in strict conformance with the contract drawings and specifications. All submittals not subject to the approval of the Contracting Officer will be submitted for Information purposes only, (FIO).

No Corps of Engineers action will be required for FIO submittals prior to incorporating these items into the work, but the submittal shall be furnished to the Area/Resident Engineer not less than 2 weeks prior to procurement of Contractor certified material, equipment, etc.

These Contractor approved submittals (FIO), will be used to verify that material received and used in the job is the same as that described and approved and will be used as record copies.

All samples of materials submitted as required by these specifications shall be properly identified and labeled for ready identification, and upon being certified by the Contractor and reviewed by the Contracting Officer, shall be stored at the site of the work for job site use until all work has been completed and accepted by the Contracting Officer.

Delegation of this approval authority to Contractor Quality Control does not relieve the Contractor from the obligation to conform to any contract requirement and will not prevent the Contracting Officer from requiring removal and replacement of construction not in contract conformance; nor does it relieve the Contractor from the requirement to furnish "samples" for testing by the Government Laboratory or check testing by the Government in those instances where the technical specifications so prescribe.

Contractor certified drawings will be subject to quality assurance review by the Government at any time during the duration of the contract.

No adjustment for time or money will be allowed for corrections required as a result of noncompliance with plans and specifications.

Submittals Requiring Government Approval (G/AE Level or G/RE Level). Where the review authority is designated to the Government, the Contractor is required to sign the certification on

ENG Form 4025 in the box beside the remarks block in Section I. The Government will code the items in block h and sign the approval action block in Section II as the approving authority.

Operating and Maintenance Instructions. Six (6) complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished. Each set shall be permanently bound and shall have a hard cover.

One (1) complete set shall be furnished at the time test procedures are submitted.

Remaining sets shall be furnished to the Contracting Officer on the date of final/acceptance inspection of the project. The following identification shall be inscribed on the covers: The words "OPERATING AND MAINTENANCE INSTRUCTIONS," name and location of the facility, name of the Contractor, and contract number. Flysheets shall be placed before instructions covering each subject. Instruction sheets shall be approximately 8-1/2 by 11 inches, with large sheets of drawings folded in. Instructions shall include but are not limited to:

- (1) System layout showing piping, valves and controls;
- (2) Approved wiring and control diagrams;
- (3) A control sequence describing startup, operation and shutdown;
- (4) Operating and maintenance instructions for each piece of equipment, including lubrication instructions and troubleshooting guide; and
- (5) Manufacturer's bulletins, cuts and descriptive data; parts lists and recommended parts.

### 3.5.2 Deviations

For submittals, which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025 shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal.

The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

The contractor is not authorized to take action on an approved deviation until the deviation is included in a final contract modification.

### 3.6 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

### 3.7 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated.

Three (3) copies of the GA submittals will be retained by the Contracting Officer and two (2) copies of the submittal will be returned to the Contractor-within the time specified-with action code.

Submittals requiring re-submittal to the Government are due immediately upon receipt by the contractor to avoid contractor delay to the project.

### 3.8 INFORMATION ONLY SUBMITTALS

Three (3) copies of the submittal will be retained by the Contracting Officer and two (2) copies returned to the contractor.

Not all FIO submittals will be reviewed by the Government. This Government review will be a quality assurance review only of a sample of the entire number of submittals. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

FIO submittals noted for re-submittal to the Government for clarification or additional data are due immediately upon receipt by the contractor.

### 3.9 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

CONTRACTOR

(Firm Name)

\_\_\_\_\_ Approved

\_\_\_\_\_ Approved with corrections as noted on submittal data and/or attached sheets(s).

SIGNATURE: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATE: \_\_\_\_\_

--End of Section--





1. Section 1 will be initiated by the Contractor in the required number of copies.
2. Each transmittal shall be numbered consecutively in the space provided for "Transmittal No.". This number, in addition to the contract number, will form a serial number for identifying each submittal. For new submittals or resubmittals, mark the appropriate box; on resubmittals, insert transmittal number of last submission as well as the new submittal number.
3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288 for each entry on this form.
4. Submittals requiring expeditious handling will be submitted on a separate form.
5. Separate transmittal form will be used for submittals under separate sections of the specifications.
6. A check shall be placed in the "Variation" column when a submittal is not in accordance with the plans and specifications--also, a written statement to that effect shall be included in the space provided for "Remarks".
7. Form is self-transmittal, letter of transmittal is not required.
8. When a sample of material or Manufacturer's Certificate of Compliance is transmitted, indicate "Sample" or "Certificate" in column c, Section I.
9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column i to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section I, column g, to each item submitted.

THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS  
SUBMITTED

- |   |    |  |    |    |   |
|---|----|--|----|----|---|
| A | -- | Approved as submitted.   | E  | -- | Disapproved (See attached).   |
| B | -- | Approved, except as noted on drawings.   | F  | -- | Receipt acknowledged.   |
| C | -- | Approved, except as noted on drawings.<br>Refer to attached sheet resubmission required. | FX | -- | Receipt acknowledged, does not comply<br>as noted with contract requirements. |
| D | -- | Will be returned by separate correspondence.   | G  | -- | Other (Specify)   |

10. Approval of items does not relieve the contractor from complying with all the requirements of the contract plans and specifications.















**DIVISION 1 - GENERAL REQUIREMENTS**

**SECTION 01451**

**CONTRACTOR QUALITY CONTROL**

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**SECTION 01451**

**CONTRACTOR QUALITY CONTROL**

**PART 1 GENERAL**

**1.1 REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

**AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

ASTM D 3740            Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

ASTM E 329            Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

**1.2 PAYMENT**

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the applicable unit prices or lump-sum prices contained in the Bidding Schedule.

**PART 2 PRODUCTS (Not Applicable)**

**PART 3 EXECUTION**

**3.1 GENERAL**

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause entitled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product that complies with the contract requirements. The system shall cover all construction operations, both on-site and off-site, and shall be keyed to the proposed construction sequence.

## 3.2 QUALITY CONTROL PLAN

### 3.2.1 General

The Contractor shall furnish for review by the Government, not later than 21 calendar days after receipt of Notice of Award of the contract, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause entitled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used. The Government will consider an interim plan for the first 15 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

### 3.2.2 Content of the CQC Plan

The CQC plan shall include, as a minimum, the following to cover all construction operations, both on-site and off-site, including work by subcontractors, fabricators, suppliers, and purchasing agents:

a. A description of the quality control organization, including a chart showing lines of authority and acknowledgement that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC system manager and an alternate CQC system manager. Each shall report to the project manager or higher in the Contractor's organization. Project manager in this context shall mean the individual with responsibility for the overall management of the project, including quality and production. Both the CQC system manager and the alternate CQC system manager shall have completed, within the last five years, the Corps sponsored course on Construction Quality Management for Contractors and shall submit copies of certificates as part of the CQC Plan. No work shall be performed on this contract without the presence of the CQC system manager or the alternate CQC system manager at the job site.

b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.

c. A copy of the letter to the CQC system manager and the alternate CQC system manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC system manager and the alternate CQC system manager, including authority to stop work which is not in compliance with the contract. The CQC system manager and the alternate CQC system manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters will also be furnished to the Government.

d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, off-site fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01330.

e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, testing laboratory, and person responsible for each test.

f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures will establish verification that identified deficiencies have been corrected.

h. Reporting procedures, including proposed reporting formats.

i. A list of the definable features of work. A definable feature of work is a task that is separate and distinct from other tasks and has separate control requirements. Different trades or disciplines could identify it, or it could be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there is frequently more than one definable feature under a particular section. This list will be agreed upon during the coordination meeting.

### 3.2.3 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC plan and operations including removal of personnel, as necessary, to obtain the quality specified.

### 3.2.4 Notification of Changes

After acceptance of the QC plan, the Contractor shall notify the Contracting Officer in writing a minimum of seven calendar days prior to any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

## 3.3 COORDINATION MEETING

After the Preconstruction Conference but before start of construction, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both on-site and off-site work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

### 3.4 QUALITY CONTROL ORGANIZATION

#### 3.4.1 CQC System Manager

The Contractor shall identify an individual within his organization at the worksite who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. This CQC System Manager shall be subject to acceptance by the Contracting Officer. The CQC System Manager shall be assigned as System Manager but may have other duties in addition to quality control.

#### 3.4.2 CQC Staff

A staff shall be maintained under the direction of the CQC System Manager to perform all CQC activities. An alternate will be identified to serve in the absence of the CQC System Manager. The staff must be of sufficient size to ensure adequate CQC coverage of all work phases, work shifts, and work crews involved in the construction. These personnel may perform other duties, but must be fully qualified by experience and technical training to perform their assigned CQC responsibilities and must be allowed sufficient time to carry out these responsibilities. The CQC plan will clearly state the duties and responsibilities of each staff member. All CQC Staff members or replacements shall be subject to acceptance by the Contracting Officer.

#### 3.4.3 Additional Requirement

In addition to the above requirements, the CQC System Manager and his/her alternate shall completed within the last 5 years the course entitled "Construction Quality Management for Contractors". This course is generally offered every quarter starting with the month of February. For further details and for the actual class schedule see the following website [http://155.76.117.11/conops/const\\_quality.htm](http://155.76.117.11/conops/const_quality.htm). This course is periodically offered by the Memphis District as well as other Corps Districts.

### 3.5 SUBMITTALS

Submittals shall be in accordance with Section 01330. The CQC organization shall be responsible for certifying that all submittals are in compliance with the contract requirements.

### 3.6 CONTROL

The controls shall include at least three phases of control to be conducted by the CQC System Manager for all definable features of work, as follows:

#### 3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work and shall include:

- a. A review of each paragraph of applicable specifications.
- b. A review of the contract drawings.
- c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.
- d. A check to assure that provisions have been made to provide required control inspection and testing.
- e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
- f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- g. A review of the appropriate activity hazard analysis to assure safety requirements are met.
- h. Discussion of procedures for constructing the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that phase of work.
- i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- j. The Government shall be notified at least 24 hours in advance of beginning any of the required action of the preparatory phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

### 3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

- a. A check of preliminary work to ensure that it is in compliance with contract requirements. Review minutes of the preparatory meeting.
- b. Verification of full contract compliance. Verify required control inspection and testing.
- c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with sample panels as appropriate.

d. Resolve all differences.

e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

f. The Government shall be notified at least 24 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

g. The initial phase should be repeated for each new crew to work on-site, or any time acceptable specified quality standards are not being met.

### 3.6.3 Follow-up Phase

Daily checks shall be performed to assure continuing compliance with contract requirements, including control testing, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon or conceal non-conforming work.

### 3.6.4 Additional Preparatory and Initial Phases

As determined by the Government, additional preparatory and initial phases may be conducted on the same definable features of work if the quality of on-going work is unacceptable, if there are changes in the applicable CQC staff, on-site production supervision or work crew, if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

## 3.7 TESTS

### 3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site in accordance with paragraph 3.7.2 below. The Contractor shall perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.

d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.

e. Results of all tests taken, both passing and failing tests, will be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test will be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an off-site or commercial test facility will be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

### 3.7.2 Testing Laboratories

#### 3.7.2.1 Laboratory Validation

A testing laboratory validated by the Material Testing Center (MTC) of the Corps of Engineers shall perform all testing of soil, gravel, aggregate, stone, concrete, and asphalt. Refer to <http://www.wes.army.mil/SL/MTC/ValStatesTbl.htm> for a complete and current list of validated commercial laboratories. This website is maintained by the MTC. If the Contractor proposes to use a commercial laboratory that is not validated or set up an on-site laboratory, he/she shall make arrangements for validation by contacting the Material Testing Center at Waterways Experiment Station, Vicksburg, Mississippi, telephone numbers: 601-634-2496 or 601-634-3610 [www.wes.army.mil/SL/MTC/inspection.htm](http://www.wes.army.mil/SL/MTC/inspection.htm). The Government will not be responsible for any cost associated with the validation of laboratories that are not currently validated. The validation process could take 60 to 90 days or more. The Contractor shall be responsible for determining the amount of time required for the validation of the proposed laboratory and accounting for this event in his/her progress schedule. If the Contractor elects to use a non-validated laboratory, the work that requires testing shall not commence until the laboratory has been validated by MTC.

#### 3.7.2.2 Capability Check

The Contracting Officer reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

#### 3.7.2.3 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor. There will be no extension of time allowed due to necessity to perform capability rechecks.

### 3.7.3 On-Site Laboratory

The Contracting Officer reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

### 3.7.4 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials will be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered by the Contractor to a location specified by the Contracting Officer.

## 3.8 COMPLETION INSPECTION

At the completion of all work or any increment thereof established by a completion time as stated in Contract Clause 52.211-10 entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the CQC System Manager shall conduct an inspection of the work and develop a "punch list" of items which do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in the CQC documentation, as required by paragraph "DOCUMENTATION" below, and shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected and so notify the Government. These inspections and any deficiency corrections required by this paragraph will be accomplished within the time stated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

## 3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

- a. Contractor/subcontractor and their area of responsibility.
- b. Operating plant/equipment with hours worked, idle, or down for repair.
- c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
- d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase should be identified (Preparatory, Initial, and Follow-up). List deficiencies noted along with corrective action.
- e. Quantity of materials received at the site with statement as to acceptability, storage, and

reference to specifications/drawings requirements.

- f. Submittals reviewed, with contract reference, by whom, and action taken.
- g. Off-site surveillance activities, including actions taken.
- h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
- i. Instructions given/received and conflicts in plans and/or specifications.
- j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily within 24 hours after the date(s) covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every seven days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

### 3.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the worksite, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer 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 such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

-- End of Section --

**DIVISION 1 - GENERAL REQUIREMENTS**

**SECTION 01452**

**PROJECT SIGNS**

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1.3	PAYMENT
PART 2	PRODUCTS (Not Applicable)
PART 3	EXECUTION (Not Applicable)

**SECTION 01452**

**PROJECT SIGNS**

**PART 1 GENERAL**

**1.1 SCOPE**

The work covered by this section consists of furnishing, erecting, maintaining, and removing project signs.

**1.2 PROJECT SIGNS**

The Contractor shall furnish, erect, and maintain two double-faced project signs at each site as designated by the Contracting Officer. The signs shall be constructed of 3/4-inch marine-grade plywood or 22 gage metal, mounted on a substantial framework of 2-inch material. Size, lettering, color and paint shall conform to the details shown on the drawing "Temporary Project Sign" included at the end of this section. Upon request, the Government will furnish without cost to the Contractor four decals of the Engineer Castle. The signs shall be erected as soon as practicable, but not later than 15 calendar days after the date established for commencement of work. The signs shall be removed upon completion of all other construction work under the contract and will become the property of the Contractor.

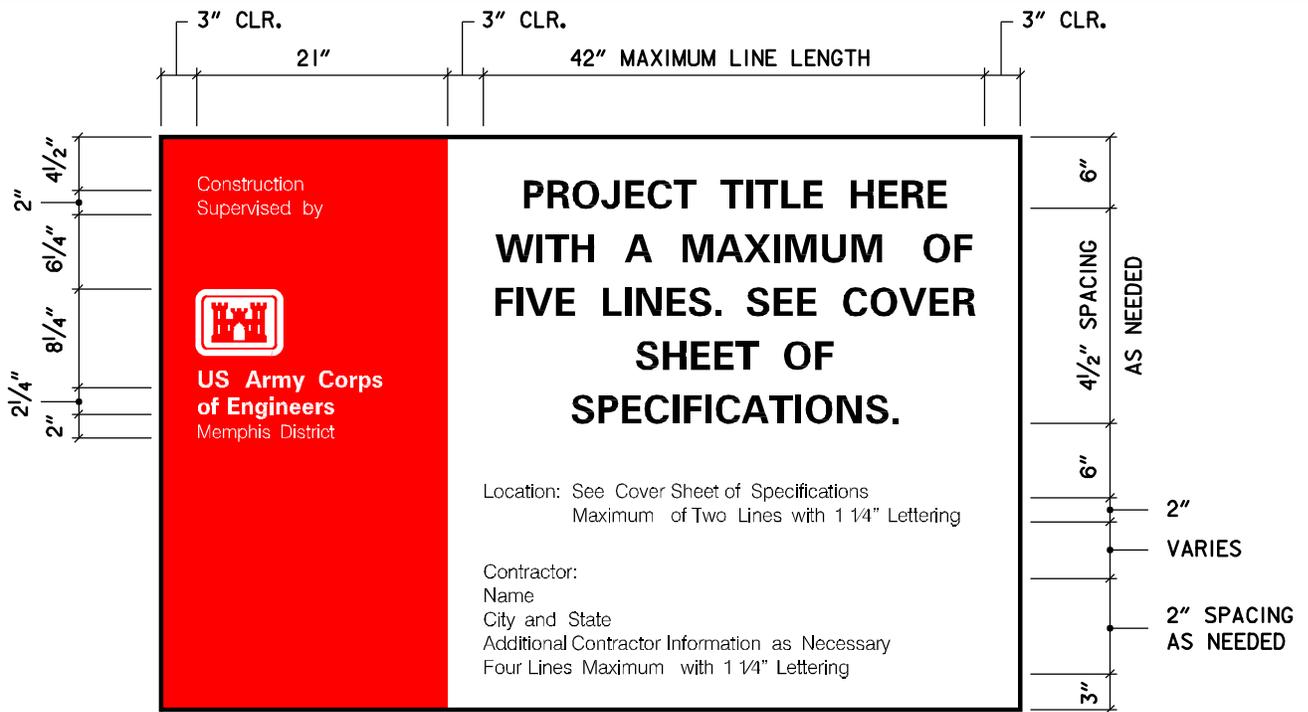
**1.3 PAYMENT**

No separate payment will be made for erecting, maintaining and removing project signs and all costs in connection therewith will be considered an incidental obligation of the Contractor.

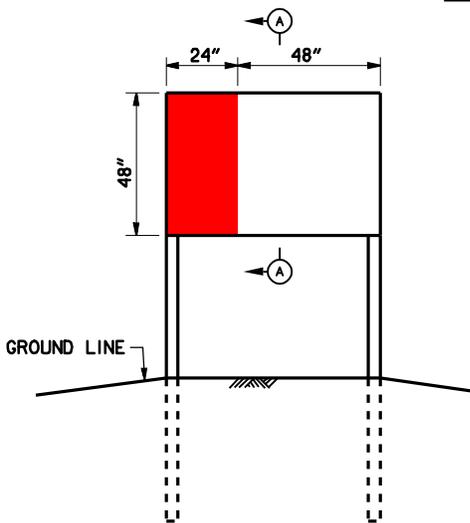
**PART 2 PRODUCTS (Not Applicable)**

**PART 3 EXECUTION (Not Applicable)**

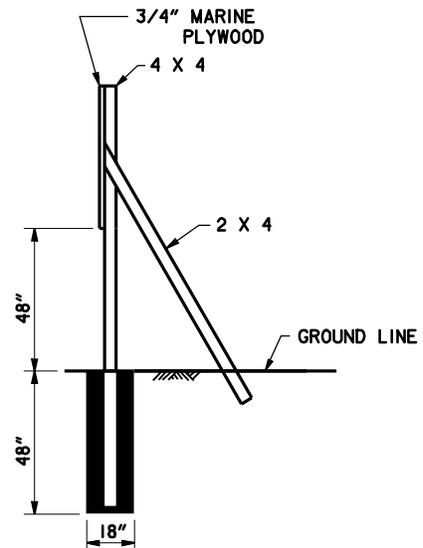
--End of Section--



## ELEVATION



ELEVATION



SECTION A-A

## SPECIFICATIONS

1. SIGN PANEL SHALL BE 4' x 6' x 3/4" MARINE PLYWOOD OR 22 GAGE SHEET METAL.
2. POSTS AND BRACING SHALL BE TREATED, NO.1 GRADE YELLOW PINE.
3. ALL EXPOSED SURFACES SHALL BE GIVEN ONE COAT OF LINSEED OIL AND WIPED PRIOR TO PRIMING.
4. ALL EXPOSED SURFACES SHALL BE GIVEN ONE COAT OF WHITE AS PRIMER. SECOND COAT SHALL BE COMMUNICATIONS RED ON LEFT AND WHITE ELSEWHERE.
5. THE LEFT SECTION SHALL BE RED WITH WHITE LEGEND. THE RIGHT SECTION SHALL BE WHITE WITH BLACK LEGEND.
6. PAINT SHALL BE BENJAMIN MOORE NO. 120-60 POLY-SILICONE ENAMEL OR APPROVED
7. ALL LETTERING SHALL BE 1/4" EXCEPT FOR THE WORDS "US Army Corps of Engineers" AND THE PROJECT TITLE. THE WORDS "US Army Corps of Engineers" SHALL BE 1/2" TALL. THE PROJECT TITLE LETTERING SHALL BE A MINIMUM OF 1/2" TALL AND A MAXIMUM OF 3/2" TALL. THE LETTERING SIZE SHALL BE CHOSEN SUCH THAT LARGEST POSSIBLE LETTERS ARE USED WITHOUT EXCEEDING A MAXIMUM LINE LENGTH OF 42". THE NUMBER OF LINES IN THE PROJECT TITLE SHALL MATCH THAT SHOWN ON THE COVER SHEET OF THE SPECIFICATIONS.

SCALE: NONE

JUNE 1998

U.S. ARMY ENGINEER DISTRICT, MEMPHIS  
CORPS OF ENGINEERS  
MEMPHIS, TENNESSEE

**TEMPORARY  
PROJECT SIGN**

DIVISION 2 - SITE WORK

SECTION 02114

CLEARING

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SECTION 02114

CLEARING

PART 1 GENERAL

1.1 SCOPE

The work provided for herein consists of furnishing all plant, labor, material and equipment, and performing all operations required for proper execution of the clearing work as specified herein. Such work includes clearing and disposal of debris therefrom, and performing all work incidental thereto.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with the contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Clearing. Location, heights, limits.

(2) Disposal of Cleared Materials. Damage to timber or improvements that are not to be cleared, disposition off-site. A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 CLEARING

3.1.1 General

Clearing shall consist of the removal of all timber, standing or felled in previous cuttings, snags, abandoned piling, vines, stumps from previous cuttings, rootwads, bushes, partially buried logs, debris from clearing operations, driftwood, and other debris in areas and to the extent specified herein below. Clearing shall be performed only to the extent necessary to install the relief wells, the corrugated metal culvert pipe, the collector ditch, and all areas necessary for operation of the Contractors equipment.

### 3.1.2 Uprooting

Within all areas where work is required, all growth, stumps, partially buried logs, snags, abandoned piling, and other projections, shall be removed by uprooting or shall be cut off flush with the existing earth surfaces.

### 3.1.3 Holes from Uprooting

All holes resulting from uprooting as permitted in 3.1.2 above shall be filled. Holes shall be filled to the elevation of the adjacent existing or excavated surfaces. Holes shall be filled with suitable earth material in 12-inch layers prior to compaction and each layer shall be compacted to a density at least equal to that of the adjacent undisturbed material.

### 3.1.4 Miscellaneous

Clearing shall be only that necessary for construction purposes and operation of equipment, and shall be subject to the approval of the Contracting Officer. Optimum effort shall be exercised by the Contractor to preserve as many trees as practicable outside the required clearing areas.

## 3.2 DISPOSAL OF CLEARED MATERIALS

### 3.2.1 General

All debris resulting from clearing operations on this contract shall be disposed of by burning, burying and/or removal from the site

### 3.2.2 Burning

The Contractor shall comply with the applicable pollution restrictions of the State of Arkansas. Subject to such restrictions and obtaining any permit which may be required by said State, the Contractor may burn material within the contract area, and at any time within the contract period. If the Contractor elects to burn, any remaining root wads or unburned wood shall be removed from the site. Burning operations shall be conducted so as to prevent damage to standing timber or other flammable growth. The Contractor will be responsible for any damage to life and/or property resulting from fires that are started by his employees or as a result of his operations. The Contractor shall furnish, at the site of burning operations, adequate fire fighting equipment to properly equip his personnel for fighting fires. Fires shall be guarded at all times and shall be under constant surveillance until they have been extinguished.

### 3.2.3 Burying

If the Contractor elects to bury the debris, all material to be buried shall be placed a minimum of 2

feet below natural ground. The buried material shall be covered with excavated material to at least natural ground so that there is at least 2 feet of cover above the debris. Debris placed for burying shall be placed in such manner that it will not disperse from the right-of-way prior to being covered with earth materials. No debris shall be buried within the berm areas.

#### 3.2.4 Removal from Site

If the Contractor elects to remove debris, resulting from clearing operations from the work site. Such disposal shall comply with all applicable Federal, State and local laws. The Contractor may, at his option retain for his own use or disposal by sale or otherwise any such materials of value. The Government assumes no responsibility for the protection or safekeeping of any materials retained by the Contractor. Such materials shall be removed from the site of the work before the date of completion of the work under this contract. The locations and manner of placement of clearing debris on the right-of-way by the Contractor for his convenience prior to removal of the debris from the site of the work shall be subject to the approval of the Contracting Officer.

--End of Section--

**DIVISION 2 - SITE WORK**

**SECTION 02215**

**GEOTEXTILE (FILTER FABRIC)**

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  - 2.1.3 Acceptance Requirements
- 2.2 SHIPMENT AND STORAGE

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- 3.1 BASE PREPARATION
- 3.2 SECURING PINS
- 3.3 INSTALLATION

**SECTION 02215**

**GEOTEXTILE (FILTER FABRIC)**

PART 1 GENERAL

1.1 SCOPE

The work provided for herein consists of furnishing all plant, labor, material, and equipment and performing all operations required for furnishing, hauling, and placing the geotextile complete, as specified herein, and maintaining the geotextile until applicable cover is completed and accepted.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Material

Conforms to specifications.

(2) Placement

Location, foundation, limits, anchoring, laps, finished surfaces.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

1.3 APPLICABLE PUBLICATION

The following publication of the issues listed below, but referred to thereafter by basic designation only, forms a part of this specification to the extent indicated by the references thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

D 1683

Failure in Sewn Seams of Woven Fabrics

D 4439	Terminology for Geosynthetics
D 4491	Water Permeability of Geotextiles by Permittivity
D 4533	Trapezoid Tearing Strength of Geotextiles
D 4632	Grab Breaking Load and Elongation of Geotextiles
D 4751	Apparent Opening Size of a Geotextile
D 4833	Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
D 4886	Abrasion Resistance of Geotextiles (Sand Paper/Sliding Block Method)

## PART 2 PRODUCTS

### 2.1 GEOTEXTILE

#### 2.1.1 General

The geotextile shall be a non-woven pervious sheet of plastic yarn as defined by ASTM D 4439. The geotextile shall meet the physical requirements listed in Table No. 1, inserted at the end of this section. The geotextile shall provide an Equivalent Opening Size (EOS) no finer than the U.S. Standard Sieve No. 100 and no coarser than the U.S. Standard Sieve No. 50. The geotextile shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of ester, propylene, ethylene, amide or vinylidene-chloride, and shall contain stabilizers and/or inhibitors added to the base plastic if necessary to make the filaments resistant to deterioration due to ultraviolet and heat exposure. The edges of the geotextile shall be finished to prevent the outer yarn from pulling away from the geotextile.

#### 2.1.2 Seams

The seams of the geotextile shall be sewn with thread of a material meeting the chemical requirements given above for geotextile yarn or shall be bonded by cementing or by heat. The sheets of geotextile shall be attached at the factory or another approved location, if necessary, to form sections using the manufacturer's standard width or a width of 12-feet, whichever is greater. Seams shall be tested in accordance with method ASTM D 1683, using 1-inch square jaws and 12 inches per minute constant rate of traverse. The strengths shall be not less than 90 percent of the required tensile strength (Table No. 1) of the unaged geotextile in any principal direction. "Table No. 1 - Physical Requirements" is at the end of this section.

### 2.1.3 Acceptance Requirements

All brands of geotextile and all seams to be used will be accepted on the following basis. The Contractor shall furnish the Contracting Officer, in duplicate, a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the geotextile. The mill certificate or affidavit shall attest that the geotextile meets the chemical, physical and manufacturing requirements stated in this specification. If requested by the Contracting Officer, the Contractor shall provide to the Government geotextile samples for testing to determine compliance with any or all of the requirements in this specification. When samples are to be provided, they shall be submitted a minimum of 60 days prior to the beginning of installation of the same geotextile. All samples provided shall be from the same production lot as will be supplied for the contract, and shall be the full manufactured width of the geotextile by at least 10 ft. long, except that samples for seam strength may be a full width sample folded over and the edges stitched for a length of at least 5 feet. Samples submitted for testing shall be identified by manufacturer's lot designation.

## 2.2 SHIPMENT AND STORAGE

During all periods of shipment and storage, the geotextile shall be protected from direct sunlight, ultra-violet rays, temperatures greater than 140 degrees F, mud, dirt, dust and debris. To the extent possible, the geotextile shall be maintained wrapped in a heavy duty protective covering.

## PART 3 EXECUTION

### 3.1 BASE PREPARATION

Areas on which geotextile is to be placed shall be dressed to remove humps and depressions within the slope lines and to provide relatively smooth and uniform surfaces to conform to the cross sections shown on the drawings and as described henceforth in this paragraph. Immediately prior to placing the geotextile, the prepared base will be inspected by the Contracting Officer and no geotextile shall be placed until those areas have been approved.

### 3.2 SECURING PINS

Securing pins shall be 3/16-inch in diameter, steel, pointed at one end and fabricated with a head to retain a steel washer having an outside diameter of no less than 1.5 inches. The length of the pins shall be no less than 18 inches. Securing pins with washers shall be inserted through both strips of overlapped cloth at not greater than 2 foot intervals along a line through the midpoint of the overlap. Additional pins shall be installed as necessary to prevent any slippage of the filter cloth regardless of location. Geotextile placed against riprap may be held in place using riprap stones.

### 3.3 INSTALLATION

The geotextile shall be placed in the locations shown on the drawings. At the time of installation, geotextile will be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage. The geotextile shall be laid smooth and free of tension, folds, wrinkles or creases. The strips shall be placed to provide a minimum width of 12 inches of overlap for each joint. The geotextile shall be secured as specified in 3.2 above and any additional securing regardless of location shall be made as necessary to prevent any slippage of the geotextile. 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. The geotextile shall be installed perpendicular to the slopes as shown on the drawings. Any geotextile damaged during its installation or during placement of the specified material upon or against the geotextile shall be replaced by the Contractor at no cost to the Government. The work shall be scheduled so that the covering of the geotextile with a layer of the specified material is accomplished within 7 days after placement of the geotextile. Failure to comply will require replacement of geotextile. The geotextile shall be protected from damage due to the placement of material thereon by limiting the height of drop of the material. Before placement of material thereon, the Contractor shall demonstrate that the placement technique will prevent damage to the geotextile. Also, after installation of geotextile, no construction equipment of any type will be allowed on the geotextile surface.

-- End of Section --

Table No. 1 - Physical Requirements

<u>Physical Property</u>	<u>Test Procedure</u>	<u>Applicable Values++</u>
Geotextile Permeability (Kg)	ASTM D 4491 Test Methods For Water Permeability of Geotextiles by Permittivity	The permeability of the Geotextile shall be greater than 0.49 Feet Per Minute (0.25 Centimeters per Second)
Tear Strength	ASTM D 4533 Trapezoidal Tear Strength	30 pounds minimum in any principal direction
Tensile Strength +(unaged geotextile)	ASTM D 4632 Determine breaking load as specified in the ASTM	200 pound minimum in any principal direction
Breaking Elongation +(unaged geotextile)	ASTM D 4632 Determine Apparent Elongation Breaking	15 percent minimum in any principal direction
Equivalent Opening Size (EOS)	ASTM D 4751 Determine Apparent Opening Size-AOS (EOS)	No finer than the U.S. Standard Sieve No. 100 and no coarser than the U.S. Standard Sieve No. 50
Puncture Strength +(unaged geotextile)	ASTM D 4833 Determine puncture resistance as specified in the ASTM	80 pound minimum
Abrasion Resistance	ASTM D 4886 Determine breaking load after abrasion test as specified in ASTM	55 pound minimum Residual Breaking Load in any principal direction
(N/A) Percent Open Area (POA)	(N/A) Specification Paragraph titled, "Determination of Percent Open Area."	(N/A) The percent of open area shall not be less than ( ) percent

+Unaged geotextile is defined as geotextile in the condition received from the manufacturer or distributor.

++All numerical values represent minimum average roll values (i.e., any roll in a lot should meet or exceed the minimum in the table).

DIVISION 2 - SITE WORK

SECTION 02225

EARTHWORK

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SECTION 02225

EARTHWORK

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, labor, materials, and equipment, and performing all operations necessary for excavation and disposal of material therefrom; backfill of culvert excavations; and all other operations incidental thereto.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with the contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

1) Excavation

Layout, bottom width, grades, slopes, alignment, transitions, disposition of materials, slides.

(2) Culvert Backfill

Layout, limits, grades and sections, compactions, tolerances, suitability of materials.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

1.3 APPLICABLE PUBLICATIONS

The following publications of the issue listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 698	Laboratory compaction Characteristics Using Standard Effort (12,400 ft-lbf/ft <sup>3</sup> (600 kN-m/m <sup>3</sup> ))
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D 1556	Density and Unit Weight of Soil In-Place by the Sand-Cone Method
D 2216	Water (Moisture) Content of Soil and Rock
D 2922	Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D 3017	Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

PART 2      PRODUCTS (Not Applicable)

PART 3      EXECUTION

3.1 EXCAVATION

3.1.1 General

The Contractor shall excavate and remove all material of whatever nature encountered as may be necessary to produce the theoretical cross sections, bottom grade, and alignment for the collector and outlet ditches, as indicated on the drawings and/or specified herein. Smooth transitions shall be effected between sections at the changes in side slopes and bottom widths. At the downstream and upstream limits of excavation, a smooth transition shall be excavated to existing channel dimensions as indicated on the drawings and also where the channel width changes as indicated on the drawings.

The approximate theoretical centerline of the channel improvement is as indicated on the drawings and may be field adjusted by the Contracting Officer to conform to conditions at the time of excavation. Smooth transitions in sections shall be made as indicated on the drawings and/or as directed. Refill of over-excavation shall be required as necessary to meet the above requirements. A tolerance of two-tenths foot above or below the theoretical cross section of the drainage ditches will be allowed provided that abrupt changes do not occur and that drainage is maintained.

3.1.2 Excavation

The Contractor shall excavate, in areas where riprap is required, in such a manner that the riprap is placed beneath the theoretical cross section as indicated on the drawings. Tolerances for such excavation shall be subject to the tolerances for riprap as specified in SECTION 02542- STONE PROTECTION paragraphs 3.2 and 3.3.2. The finished grade of the adjacent channel excavation shall conform to the finished riprap grade at and in the vicinity of the junctions of these surfaces.

### 3.1.3 Collector Ditches

The Contractor shall excavate new collector ditches within the right-of-way limits to the lines and grades as shown on the drawings, to provide for drainage into outlet ditches. Each collector ditch shall be excavated with 1V on 2H side slopes and a 4-foot or 10 foot bottom width as shown on the drawings, unless otherwise directed by the Contracting Officer. The riverside top bank of the collector ditch shall be excavated starting at a distance of 5 feet landward of the edge of the relief well pad as shown on the drawings.

### 3.1.4 Outlet Ditch

The Contractor shall enlarge the existing outlet ditch within the right-of-way limits to the lines and grades as shown on the drawings to provide drainage for the collector ditches. The outlet ditch shall be excavated with 1V on 2.5H side slopes and a 12 foot bottom width as shown on the drawings, unless otherwise directed by the Contracting Officer.

## 3.2 DISPOSAL OF EXCAVATED MATERIAL

Excavated material shall be utilized to the extent necessary to backfill the culvert excavations. Excavated material which is not utilized in the culvert backfill shall be placed in the "Excavated Material" areas indicated on the drawings. Material placed in the disposal area shall be placed with slopes as indicated on the drawings and shall be dressed to provide smooth even surfaces, and in such manner that drainage will result. Placement of excavated material shall be such that water will not be impounded. Excavated material shall be disposed of within the right-of-way limits as indicated on the drawings and/or specified herein. Slopes on the drawings and those prescribed hereinafter define the limits of the area within which excavated material must be confined but do not necessarily indicate stable slopes for such material. The Contractor shall be responsible for placing the various materials to be disposed of in such locations within the prescribed disposal areas that they will not flow or slide outside the disposal areas. The height of excavated material embankment may vary as indicated therefor on the drawings. The back slopes of excavated material embankment shall be as indicated on the drawings. End slopes of the excavated material embankment shall be not steeper than 1V on 3H. Side slopes of excavated material embankment shall be as indicated on the drawings. Placement of excavated material shall be such that water will not be impounded within the excavated material disposal areas. Dressing of the material will be required as necessary to provide drainage and the specified dimensions and slopes and as specified in SECTION 02936 - ESTABLISHMENT OF TURF. The Contractor shall place all material in the designated disposal areas and some material may have to be placed at locations other than immediately adjacent to the point of excavation. Compaction will not be required except as specified hereinabove and except that obtained in the process of placing and dressing. Sunken logs, stumps, driftwood, and other debris removed concurrently with the excavation shall be disposed of as specified for clearing debris in paragraph 3.2 of SECTION 02114 - CLEARING.

### 3.3 CULVERT BACKFILL

#### 3.3.1 General

Culvert backfill materials shall be placed to the lines, grades, and sections as indicated therefor on the drawings and as directed by the Contracting Officer. The Contracting Officer will determine the suitability of each section of the foundation for placing materials thereon.

#### 3.3.2 Materials

Materials for culvert backfill shall be those materials resulting from the required excavation which, in the opinion of the Contracting Officer, are suitable for such embankment work. No unsuitable organic or inorganic matter, sticks, trash, building debris, brush, trees, tree roots, stumps, rubbish, sod, muck, frozen material or any other objectionable matter shall be placed therein. The Contractor shall, when directed, remove any materials that the Contracting Officer considers objectionable in the backfill.

#### 3.3.3 Placement

Culvert backfill shall be placed in layers not exceeding 6 inches in thickness prior to compaction. Any approved equipment may spread the materials and each layer shall be compacted as specified in 3.3.4 below. Fill within two feet of the culverts shall be compacted by means of hand-operated mechanical tampers, as described in paragraph 3.2.2 of SECTION 02700 – CULVERT INSTALLATION. All fills shall be kept thoroughly drained and no fill shall be placed on frozen ground. When, in the opinion of the Contracting Officer, the surface of any layer is too smooth to bond properly with the succeeding layer, it shall be adequately scarified before the succeeding layer is placed. A tolerance of two-tenths of one foot above the prescribed grade and cross section will be permitted in the final dressing.

#### 3.3.4 Compaction

Each layer of backfill to the height of 2 feet above the top of the culvert pipe shall be compacted to a density of at least 95 percent of the laboratory density obtained by the standard density test (ASTM D 698). The field density determination shall be by the Sand-Cone Method (ASTM D 1556) or the Nuclear Method (ASTM D 2922, Method B). The moisture content after compaction shall be within the limits of 2 percentage points above optimum and 3 percentage points below optimum moisture content as determined by the Contractor in accordance with ASTM D 698. The field moisture content after compaction shall be performed in accordance with ASTM D 2216 or ASTM D 3017. The materials may require moistening or aerating as necessary to provide the above-specified moisture content. The Contractor will perform standard laboratory density tests as specified in ASTM D 698 for each type of material used in the fill to determine optimum water content and maximum densities and will perform field density and water content tests. The Contractor shall perform field density and water content tests on each layer of material placed to assure that proper compaction is being achieved. The locations where the Contractor is to take the field density and

water content tests shall be as specified by the Contracting Officer.

### 3.4 SLIDES AND SHOALS

#### 3.4.1 Ditch Excavation Areas

In case sliding or shoaling occurs in any part of the ditch excavation prior to the final acceptance of the work, the Contractor shall repair such portions of the slides and shoals as the Contracting Officer may direct. In case the slide or shoal is caused through the fault of the Contractor, it shall be repaired without cost to the Government. In case the slide or shoal is due to no fault of the Contractor, the yardage ordered removed will be included in the yardage to be paid for at the contract unit price per cubic yard for "Excavation". Material removed from the slides and shoals shall be disposed of in the disposal areas in accordance with the provisions of 3.2 above.

#### 3.4.2 Culvert Excavation Areas

In the event of sliding of any part of the excavation specified in 3.1.1 above, or embankment placed in the disposal areas, after completion but prior to acceptance, the Contractor shall, upon written order of the Contracting Officer, repair the slide as directed. In case the slide is caused through the fault of the Contractor, repairs shall be performed without cost to the Government. In case the slide is due to no fault of the Contractor, an equitable adjustment in the contract price will be made for its repair in accordance with CONTRACT CLAUSE entitled "Changes."

--End of Section--

DIVISION 2 - SITE WORK

SECTION 02542

STONE PROTECTION

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## PART 2 PRODUCTS

### 2.1 STONE

#### 2.1.1 General

All stone shall be durable material as approved by the Contracting Officer. The sources from which the Contractor proposes to obtain the material shall be selected well in advance of the time when the material will be required. In case an undeveloped source is to be used, the Contractor will be required to show that an ample quantity of material is available before quality tests will be made. Stone for riprap shall be of a suitable quality to ensure permanence in the structure and in the climate in which it is to be used. It shall be free from cracks, seams and other defects that would tend unduly to increase its deterioration from natural causes. The inclusion of objectionable quantities of dirt, sand, clay and rock fines will not be permitted.

#### 2.1.2 Sources and Evaluation Testing

Riprap shall be obtained in accordance with the provisions in SECTION 00800 special contract requirements, paragraph SP 15. The Contractor shall submit suitable test reports and service records to show the acceptability of the riprap. If the Contractor proposes to furnish riprap from a source not currently listed, the Contractor will make such investigations as necessary to determine whether acceptable riprap can be produced from the proposed source. Satisfactory service records on work outside the Corps of Engineers will be acceptable. In order for riprap to be acceptable on the basis of service records, riprap of a similar size must have been placed in a similar thickness and exposed to weathering under similar conditions as is anticipated for this contract, and have satisfactorily withstood such weathering for a minimum of twenty years. If no such records are available, the Contractor will make tests to assure the acceptability of the riprap. The tests to which the riprap may be subjected will include petrographic analysis, specific gravity, abrasion, absorption, wetting and drying, freezing and thawing and such other tests as may be considered necessary by the Contracting Officer. The following guidance is provided for use by the Contractor in analyzing a new source of riprap. Riprap that weighs less than 155 lbs/c.f. or has more than 2% absorption will not be accepted unless other tests and service records show that the riprap is satisfactory. The method of testing for unit weight will be CRD-C 106. The method of testing for absorption will be CRD-C 107. Samples shall be taken by the Contractor under the supervision of the Contracting Officer at least 60 days in advance of the time the placing of the riprap is expected to begin. The Contractor has the responsibility to assure the tests are performed in accordance with applicable Corps of Engineers' methods of testing given in the Handbook for Concrete and Cement, and will be performed at an independent, approved testing laboratory. The cost of testing will be borne by the Contractor.

### 2.1.3 Gradation

Gradation shall conform to the R-90 and R-200 RIPRAP GRADATION CURVES at the end of this section and format thereof shall be as shown. Neither the width nor the thickness of any piece shall be less than one-third of its length. Stone shall be reasonably well graded between the largest and smallest pieces. The gradation curve plot or graph from each gradation test performed on the R-90 and R-200 riprap shall fall within the upper and lower limit curves plotted thereon. Gradation limits for R-90 and R-200 stone are provided as Plates IV and V. The Contractor shall submit to the Contracting Officer a copy of the plot for each gradation test on the gradation graph provided as Plate VII.

### 2.1.4 Test Method

Gradation test method shall conform to the requirements of "LMVD Standard Test method for Gradation", which is inserted at the end of this section as PLATE I. An Example Gradation Test Data Sheet, an Example R-90 Gradation and a blank Gradation Test Data Sheet are provided as Plates II, III and VI respectively.

### 2.1.5 Gradation Test

The Contractor shall perform a gradation test or tests on the riprap at the quarry. At least one gradation test shall be performed. The sample shall be taken by the Contractor under the supervision of the Contracting Officer, shall consist of not less than 25 tons of riprap and shall be collected in a random manner which will provide a sample which accurately reflects the actual gradation arriving at the jobsite. If collected by the truckload, each truckload shall be representative of the gradation requirements. The Contractor shall provide all necessary screens, scales and other equipment, and the operating personnel therefor, and shall grade the samples, all at no additional cost to the Government. For each sample, the Contractor shall record, plot, and submit the gradation data, using the form noted at the end of this section, to the Contracting Officer. The Contractor shall submit to the Contracting Officer a copy of the plot for each gradation test on the gradation graph.

## PART 3 EXECUTION

### 3.1 BASE PREPARATION

Areas on which the geotextile fabric and riprap are to be placed shall be dressed to conform to cross sections shown on the contract drawings and as specified herein. Humps and depressions within the slope lines shall be dressed to provide relatively smooth and uniform surfaces. Immediately prior to placing the filter material, the prepared base will be inspected by the Contracting Officer and no material shall be placed thereon until that area has been approved.

## 3.2 PLACEMENT OF GEOTEXTILE FABRIC

Geotextile fabric for riprap filter shall be placed on the prepared base to the lines and grades as indicated on the contract drawings and in such manner as to avoid damage to the prepared base. Any damage to the surface of the prepared base during placing of the material shall be repaired before proceeding with the work.

## 3.3 RIPRAP

### 3.3.1 General

Riprap shall be placed on the prepared base and/or filter material within the limits shown on the contract drawings. Riprap shall be as specified in 2.1 above.

### 3.3.2 Placement

Riprap shall be placed in a manner which will produce a reasonably well-graded mass of rock with the minimum practicable percentage of voids, and shall be constructed, within the specified tolerance, to the lines and grades indicated on the contract drawings. A tolerance of plus 6 inches and minus 3 inches from the required finished surface of the riprap will be allowed provided these extremes do not occur adjacent to each other, and that neither extreme exists over more than 10 percent of the total area. Riprap shall be placed to its full course thickness in one operation and in such manner as to avoid displacing the filter material. The riprap shall be placed in the channel bottom first and then proceed up the slope. The larger stones shall be well distributed and the entire mass of stones in their final position shall be graded to conform to the gradation specified in 3.3.1 above. The finished riprap shall be free from objectionable pockets of small stones and clusters of larger stones. Placing riprap in layers will not be permitted. Placing riprap by dumping it at the top of the slope and pushing it down the slope will not be permitted. The desired distribution of the various sizes of stones throughout the mass shall be obtained by selective loading of the material at the quarry or other source; by controlled dumping of successive loads during final placing; or by other methods of placement which will produce the specified results. The Contractor shall use procedures to insure that the indicated distribution of the various sizes of riprap is maintained throughout placement in the completed structure.

-- End of Section --

# LMVD STANDARD TEST METHOD FOR GRADATION

December 14, 1998

- A. Select a representative sample (Note #1), weigh and dump on hard stand.
- B. Select four specific size stones to use as reference stones (a1, b1, c1, and d1) while performing the "individual weight larger than" test (see example & Note #2). Selected stone sizes should represent an evenly distributed cross section of the various size stones contained within the sample. Reference stone "a1" is typically the largest stone in the sample. Procedure is similar to the standard aggregate gradation test for "individual weight retained".
- C. Determine the largest size stone in the sample. (100% size)
- D. Separate the sample into piles starting with the stones that are larger than reference stone "b1" and proceeding to the smallest stones. The first pile should contain all stones larger than reference stone "b1" and smaller than "a1", the largest stone. Pile two should contain all stones larger than "c1" and smaller than "b1". Pile 3 should contain all stones larger than "d1" and smaller than "c1". The remaining pile should contain all stones smaller than "d1". Use reference stones for visual comparison in separating the obviously "larger than" stones. Stones that appear close to a specific size reference stone must be individually weighed. If a stone is heavier than the specific size reference stone, it should be placed in the pile containing the stones larger than the reference stone. Weigh each pile as a whole or cumulatively adding each stone in the individual piles.
- E. Paragraph D above will result in "individual weight retained" figures. Calculate individual percent retained (heavier than) and cumulative percent retained and cumulative percent passing (lighter than). Record test results on the "Gradation Test Data Sheet" (plate V) as shown on example plate III. Plot percent finer by weight, along with the specification curves on ENG Form 4055.
- F. See plate V and plate VI for a blank "Gradation Test Data Sheet" and a blank ENG Form 4055. Plates VII, VIII, and IX have been provided for the convenience of the contractor and can be used as necessary. These three plates have the upper and lower specification limits for "R-90", "R-200", and "R-650" pre-plotted on ENG Form 4055.

## NOTES

- Sample Selection. The most important part of the test and the least precise is the selection of a representative sample. No "standard" can be devised; larger quarry run stone is best sampled at the shot or muck pile by given direction to the loader; small graded riprap is best sampled by random selection from the transporting vehicles. If possible, all parties should take part in the sample selection and agree before the sample is run that the sample is representative.
- Selection of Size for Separation. It is quite possible and accurate to run a gradation using any convenient sizes for the separation, without reference to the specifications. However, it is usually more convenient to select weights from the gradation limits, such as the 90 lbs., 40 lbs., 20 lbs., and 5 lbs. as shown in the following "R-90" example. After the test is plotted on ENG 4055 and a curve drawn, the gradation limits from the specifications shall be plotted.

# (EXAMPLE)

## GRADATION TEST DATA SHEET

Quarry AAA Quarry Inc. Stone Tested R-90

Date of Test 24 May 79 Testing Rate \_\_\_\_\_

### TEST REPRESENTS

Contract No.	District	Tons
DACW66-79-C-0005	Memphis	16
	TOTAL	16

### GRADATION

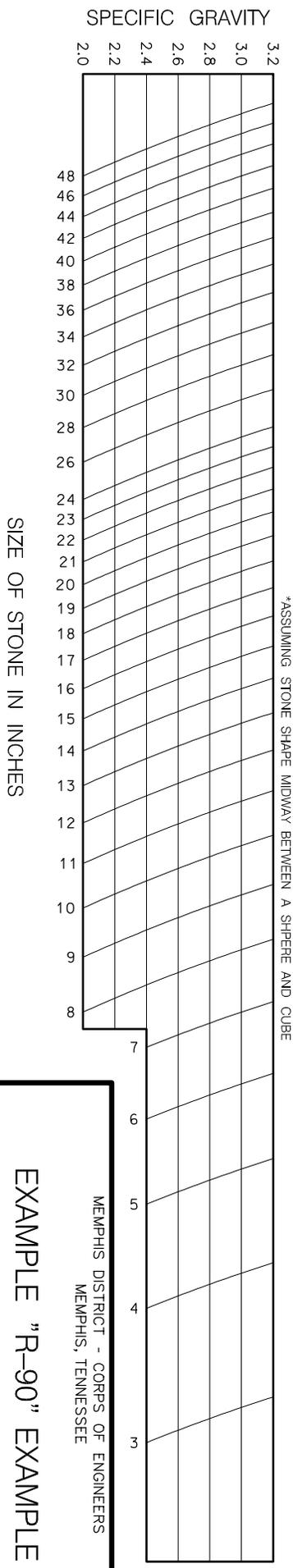
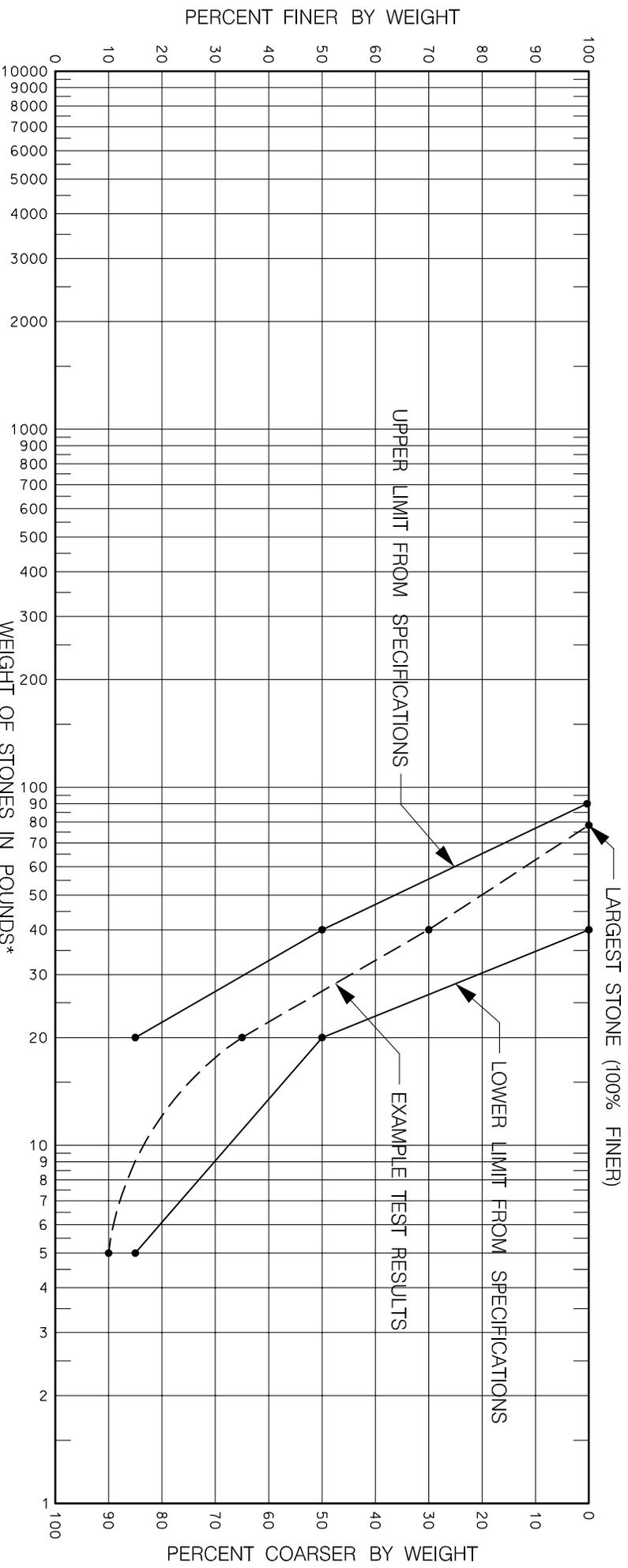
Stone Size (lbs.)	Individual Weight Retained	Individual % Retained	Cumulative %Coarser	%Finer	Specification % Finer by wt
90 "a1"	0	0	0	100	100
40 "b1"	9600	30	30	70	100-50
20 "c1"	11200	35	65	35	50-15
5 "d1"	8000	25	90	10	<15
< 5 "d1"	3200	10	100	-	
Total Weight	32000lbs				

Remarks: LARGEST STONE SIZE = 78 LBS

I Certify that the above stone sample is representative of the total tonnage covered by this test report.

Contractor Representative: Representative's Name and Signature

Government Representative: Representative's Name and Signature



MEMPHIS DISTRICT - CORPS OF ENGINEERS  
 MEMPHIS, TENNESSEE

**EXAMPLE "R-90" EXAMPLE**

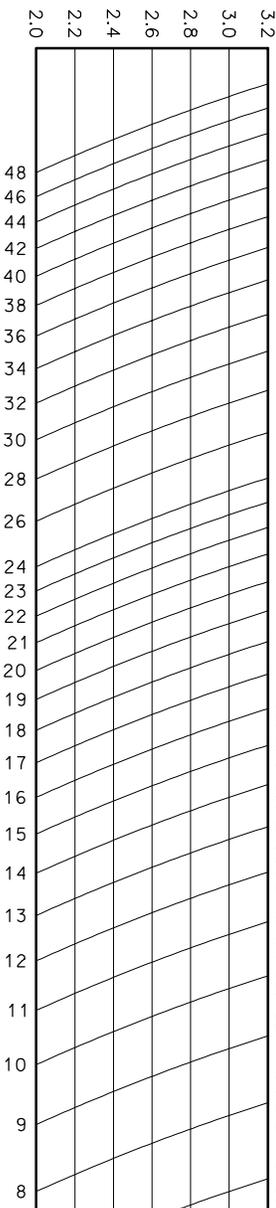
DACW66-79-C-0005  
 PROJECT: NEW FRANKLIN DITCH  
 DATE: 24 MAY 79

RIPRAP GRADATION CURVES

PLATE IV

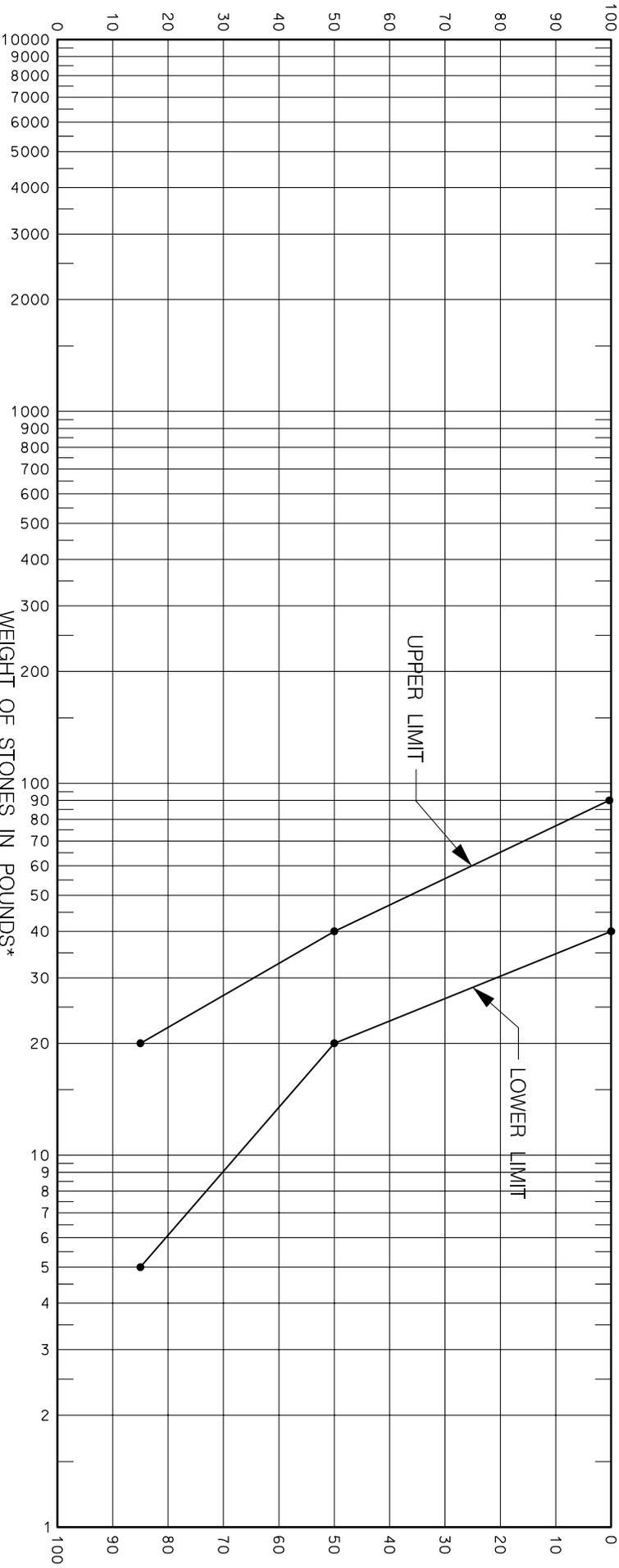
SIZE OF STONE IN INCHES

SPECIFIC GRAVITY



WEIGHT OF STONES IN POUNDS\*  
SPECIFIC GRAVITY OF ROCK \_\_\_\_\_  
\*ASSUMING STONE SHAPE MIDWAY BETWEEN A SPHERE AND CUBE

PERCENT FINER BY WEIGHT



PERCENT COARSER BY WEIGHT

MEMPHIS DISTRICT - CORPS OF ENGINEERS  
MEMPHIS, TENNESSEE

"R-90"

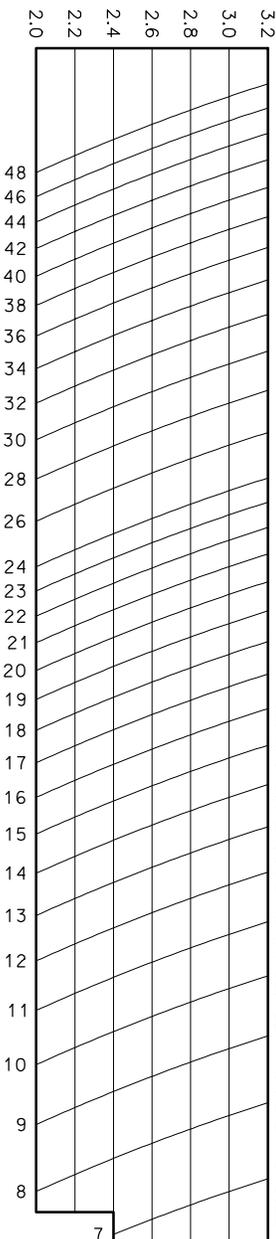
PROJECT: \_\_\_\_\_ DATE: \_\_\_\_\_

RIPRAP GRADATION CURVES

PLATE V

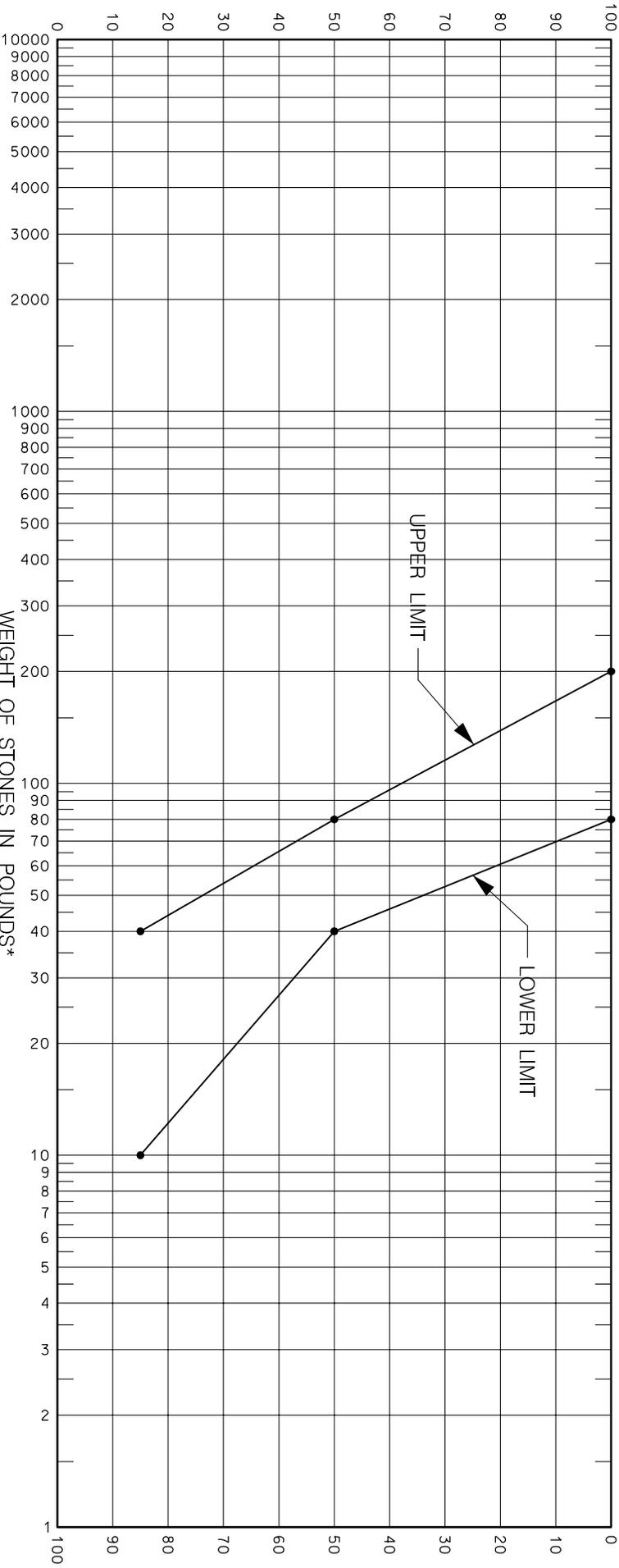
SIZE OF STONE IN INCHES

SPECIFIC GRAVITY



WEIGHT OF STONES IN POUNDS\*  
SPECIFIC GRAVITY OF ROCK \_\_\_\_\_  
\*ASSUMING STONE SHAPE MIDWAY BETWEEN A SPHERE AND CUBE

PERCENT FINER BY WEIGHT



PERCENT COARSER BY WEIGHT

MEMPHIS DISTRICT - CORPS OF ENGINEERS  
MEMPHIS, TENNESSEE

"R-200"

PROJECT: \_\_\_\_\_ DATE: \_\_\_\_\_

RIPRAP GRADATION CURVES

**G R A D A T I O N   T E S T   D A T A   S H E E T**

Quarry \_\_\_\_\_ Stone Tested \_\_\_\_\_

Date of Test \_\_\_\_\_ Testing Rate \_\_\_\_\_

**T E S T   R E P R E S E N T S**

Contract No.	District	Tons
TOTAL		

**G R A D A T I O N**

Stone Size (lbs)	Individual Weight Retained	Individual % Retained	Cumulative %Coarser	%Finer	Specification % Finer by wt
Total Weight					

Remarks: \_\_\_\_\_

I Certify that the above stone sample is representative of the total tonnage covered by this test report.

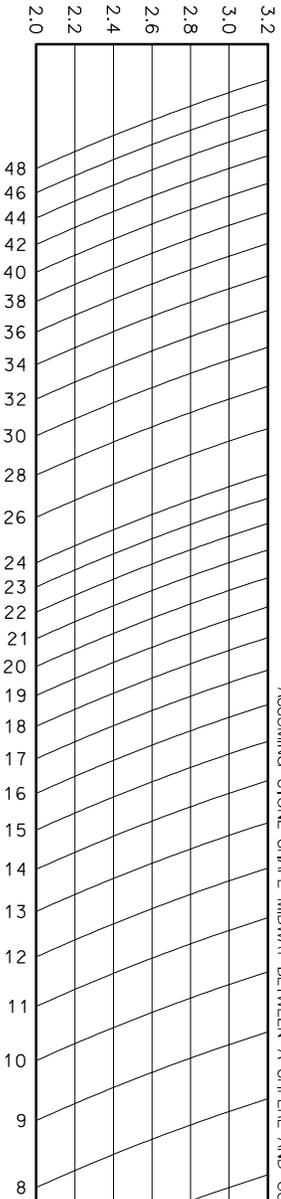
Contractor Representative \_\_\_\_\_

Government Representative \_\_\_\_\_

PLATE VII

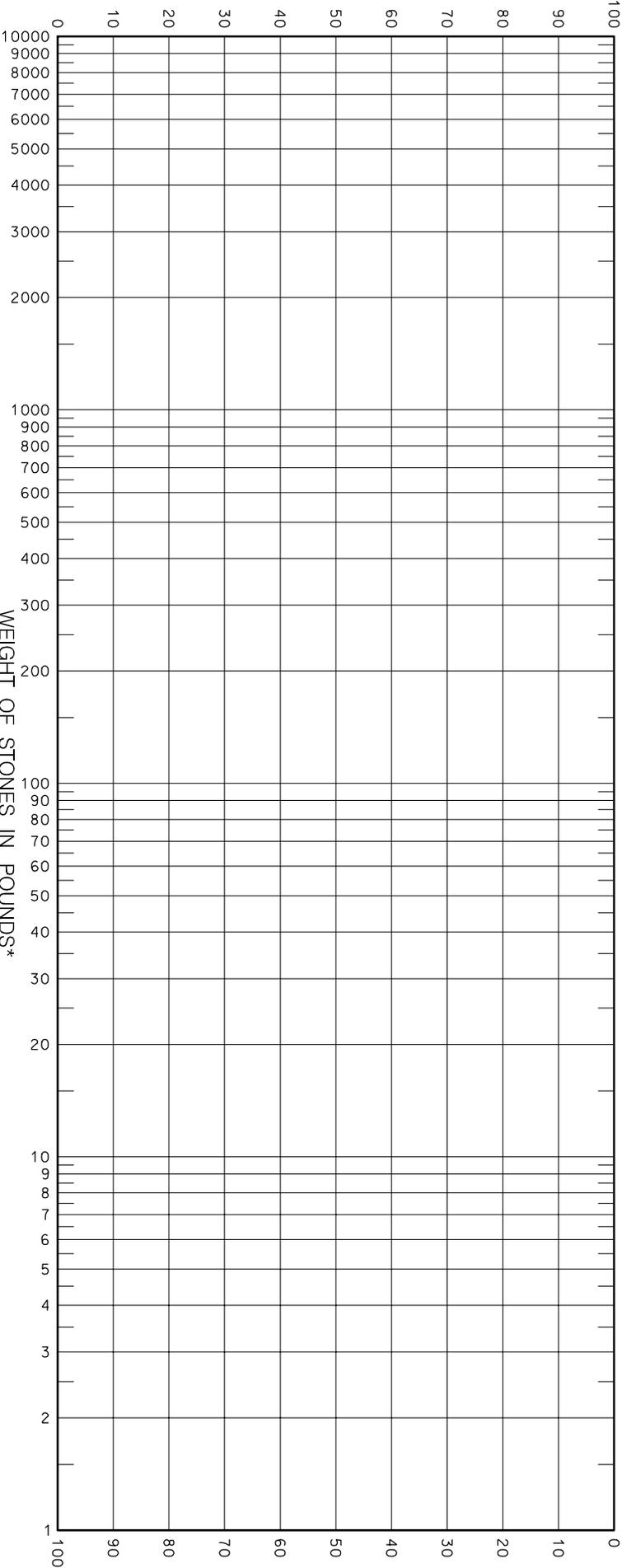
SIZE OF STONE IN INCHES

SPECIFIC GRAVITY



WEIGHT OF STONES IN POUNDS\*  
SPECIFIC GRAVITY OF ROCK \_\_\_\_\_  
\*ASSUMING STONE SHAPE MIDWAY BETWEEN A SPHERE AND CUBE

PERCENT FINER BY WEIGHT



PERCENT COARSER BY WEIGHT

MEMPHIS DISTRICT - CORPS OF ENGINEERS  
MEMPHIS, TENNESSEE

PROJECT: \_\_\_\_\_ DATE: \_\_\_\_\_

RIPRAP GRADATION CURVES

DIVISION 2 – SITE WORK

SECTION 02546

AGGREGATE SURFACING

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SECTION 02546

AGGREGATE SURFACING

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, labor, materials, and equipment, and performing all operations necessary for preparation of the existing gravel surface and construction of compacted aggregate surface in areas identified on the plans.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

1.2.1 Subgrade

Location, preparation.

1.2.2 Materials

Material delivered to the site shall conform to the specifications.

1.2.3 Placement

Width, thickness, distribution, compaction, final grading, and maintenance.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to elsewhere in this section by basic designation only, form a part of the specification to the extent indicated by the references thereto:

AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)  
PUBLICATIONS

D 422	Particle-Size Analysis of Soils
D 4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils

## PART 2 PRODUCTS

### 2.1 AGGREGATES

Aggregate for resurfacing shall be composed of sand-clay-gravel mixtures; gravel or stone screenings; crusher run coarse aggregate consisting of gravel; or any combination of such materials which conforms to specified requirements. All material shall be free from organic matter and lumps or balls of clay. The material shall conform to the requirements as specified in 2.1.1 and 2.1.2 below, and shall conform to the gradation specified in 2.1.3 below as determined by ASTM D 422. All aggregate surfacing furnished under this contract shall comply favorably with representative samples as to quality, gradation, and moisture content.

#### 2.1.1 Coarse Aggregate

Coarse aggregate is defined as aggregate retained on the No. 10 (2.00 mm) sieve. Coarse aggregate shall consist of hard, durable particles or fragments of stone or gravel. Materials that are soft, pliable, or subject to rapid deterioration when exposed to weathering shall not be used.

#### 2.1.2 Fine Aggregate

Fine aggregate is defined as aggregate passing the No. 10 (2.00mm) sieve. Fine aggregate shall consist of natural or crushed sand, and also shall include fine mineral particles passing the No. 200 (0.075 mm) sieve. The fraction of the material passing the No. 200 (0.075 mm) sieve shall be no more than two-thirds that of the fraction passing the No. 40 (0.425 mm) sieve. That portion of the aggregate passing the No. 40 (0.425 mm) sieve shall have a liquid limit of not more than 35 and a plasticity index of not less than 6 nor more than 15, as determined by ASTM D 4318.

#### 2.1.3 Gradation

Aggregate surface material shall conform to the following gradation when it is delivered to the job site and before it is placed on the roadway:

<u>U.S. Standard Sieve</u>	<u>Permissible Limits Percentage by Weight, Passing</u>
3"	100
1-1/2"	95-100
3/4"	65-100
3/8"	40-80
No. 4	30-60
No. 10	20-50
No. 40	15-35
No. 200	5-15

## 2.2 SAMPLING AND TESTING

### 2.2.1 General

Representative samples for testing of the material shall be taken by the Contractor in the presence of the Contracting Officer or his representative. All costs of the sampling and testing, except as specified in 2.2.3 below, shall be borne by the Contractor and no separate payment will be made therefor.

### 2.2.2 Contractor Testing

Prior to delivery of any material to the job site, the material shall be tested for compliance with the specifications by an approved independent testing laboratory. Such tests shall be performed before each 5,000 cubic yards of material is delivered to the job site under this contract, and in the event a noticeable change in the materials is observed during placement, such testing shall be performed at the direction of the Contracting Officer regardless of the quantity of material delivered. Certified results of the tests shall be submitted to the Contracting Officer for review before the next 5,000 cubic yards of material is delivered to the job site. When a noticeable change is observed during placement of the material, samples shall be obtained from the delivery truck and a gradation test shall be performed by an approved testing laboratory. If this test fails to meet the requirements, then the questionable material shall be removed from the job site.

### 2.2.3 Government Testing

At the same time that samples for Contractor testing as specified in 2.2.2 above are taken, the Contractor shall take samples for assurance testing to be performed by and at the expense of the Government. The Contractor shall deliver such samples to [Wynne Area Office](#), 1932 N. Falls Boulevard, P.O. Box 729, Wynne, Arkansas 72396-0729. Notice of assurance sample deliveries shall be given to the Contracting Officer's Representative prior to delivery.

## PART 3 EXECUTION

### 3.1 CLEARING AND DEBRIS REMOVAL

All grass, weeds, sod, and other debris shall be cleared from the subgrade prior to gravel placement. Debris resulting from clearing operations shall be removed from the levee district right-of-way, in compliance with all Federal, State, and local laws. The side slopes shall be disturbed the least amount practicable, and shall be returned to a smooth slope upon completion of clearing and resurfacing operations.

### 3.2 USE OF HAUL ROADS

The Contractor shall acquaint himself with load limits and other regulations applicable to his use of public roads and/or highways for deliveries to be made under this contract and shall comply with all such load limits and regulations. Haul roads on the levee or and its appurtenances which are used by the Contractor shall be maintained by him in a condition satisfactory for vehicular traffic. The Contractor shall not operate hauling equipment on the levee slopes except at ramps.

### 3.3 SUBGRADE

The subgrade shall be symmetrical about the centerline of the roadway and shall be prepared as indicated on the drawings and so that drainage will occur each way from the centerline. Subgrades for roadways shall be graded and smooth. All potholes and ruts in the existing roadway surface shall be repaired in advance of resurfacing by removing any soft material in and/or adjacent to the potholes and ruts. Resurfacing material shall be placed and compacted until the damaged area is restored to the same elevation as the surrounding undamaged road surface. The potholes and ruts shall be dry at the time of repair.

### 3.4 PLACEMENT

(1) Aggregate shall be placed and spread upon the subgrades of roadway surfaces in the amount required to produce a pavement with width and compacted thickness as indicated on the drawings. A tolerance of plus 2 tenths and minus 0 tenths from the required finish surface of the aggregate resurfacing will be allowed provided these extremes do not occur adjacent to each other, and neither extreme exists over more than 10 percent of the total area. The aggregate material shall be placed in layers of uniform thickness not to exceed 9 inches before compaction. Each layer shall be compacted by at least four passes of a pneumatic tired roller having a tire pressure of 35 to 40 pounds per square inch and a gross weight of not less than 20,000 pounds or by other approved compacting equipment which will obtain comparable compaction. A pass of the roller shall consist of the completed coverage of the surface by the roller. The compaction passes of the roller shall not be performed when the material is so wet that it is displaced under the roller or when the material is too dry for proper bonding. The placement shall be commenced at the nearest point of delivery of the resurfacing material to a reach of roadway and shall be carried continuously away from such point unless otherwise authorized by the Contracting Officer. Placing of aggregate will not be allowed when the roadway surface, in the opinion of the Contracting Officer, is too wet to place aggregate. No unspread aggregate shall be left in a piled condition overnight. Reaches of resurfacing which are no longer needed for haul roads for supplying the aggregate shall be graded and dressed to provide a slope each way from the centerline. In the event aggregate is hauled over rolled portions of the resurfacing, such portions shall subsequently be graded, dressed and rolled again as specified hereinabove at no additional cost to the Government. The resurfacing shall be maintained in an acceptable condition until acceptance.

(2) By the end of each workday, all aggregate surfacing hauled and placed on the roadway shall be spread and blended into the existing roadway surface as specified in subparagraph (1) above. At no time under this contract shall aggregate surfacing be dumped and left at the end of the workday without being placed as specified above.

### 3.5 MAINTENANCE

The Contractor shall maintain the aggregate surface in a good and satisfactory condition until acceptance. The Contractor shall correct any deficiencies in width and thickness and shall remove, dispose of as described in paragraph 3.1 above, and replace, without additional compensation, any deficient material placed in the work.

-- End of Section --

DIVISION 2 – SITE WORK

SECTION 02700

CULVERT INSTALLATION

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SECTION 02700

CULVERT INSTALLATION

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all labor, equipment, and materials, and performing all operations necessary for the installation of new corrugated metal pipe culverts, all as indicated on the drawings, and/or specified herein.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including but not limited to the following:

(1) Materials. Review, prior to submittal, of certificates for compliance with specification requirements.

(2) Installation. Length, type, location, alignment, grade, slope, foundation bedding, coupling bands, repair of damaged areas.

(3) Backfill. Thickness of layers, maintenance of culvert alignment, compaction, elevation.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto:

American Society for Testing and Materials (ASTM) Publications.  
A 760/A760M95-b                      Corrugated Steel Pipe, Metallic-

	Coated for Sewers and Drains
A 849	Post Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
D 698	Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft <sup>3</sup> (600kN-m/m <sup>3</sup> ))
D 1556	Density and Unit Weight of Soil in Place by the Sand-Cone Method
D 2922	Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Pipe

The zinc coated (Galvanized) corrugated metal pipe culvert shall conform to the requirements of ASTM A 760, for Type I and ASTM A 849, for fully coated using Class A material. As an alternate, aluminum coated (Aluminized) corrugated metal pipe culverts may be used conforming to ASTM A 760, Type I with no bituminous coating required. The manufacturer's certified statement as to quality will be accepted in lieu of performing the prescribed tests. Certificates required for demonstrating proof of compliance shall be in compliance with SPECIAL CONTRACT REQUIREMENTS SP 5. The pipe shall be fabricated from 0.079 inches thick sheets. Coupling bands for joints may be 0.064 inches thick or heavier and shall be installed as recommended by the materials manufacturer except as specified herein. Coupling bands shall be coated as specified hereinabove for the pipe and shall have corrugations, not projections, that mesh with the pipe corrugations, and if helical corrugations are used, each length of helical pipe used shall have a minimum 12-inch length of annular corrugations at each end. All installation hardware shall be as recommended by the materials manufacturer. Inlet and outlet sections shall be unjointed sections at least 20 feet in length.

## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Culvert Pipe

The required length for each culvert shall be determined by the Contractor and verified with the Contracting Officer prior to ordering each culvert. The pipe shall be placed at the location indicated

on the drawings. Installation of the pipe shall be accomplished in the dry. The pipe shall be bedded on a smooth surface with invert elevation as determined in the field. Joints shall be carefully made by the material manufacturer's standard method, subject to the provisions of 2.1.1 above. Pipe shall be handled with care so that damage to the coating will be minimized. Coupling band rods, if applicable, and damaged areas of pipe shall be coated with approved asphaltic cement prior to placement of backfill, and in case damaged areas are at joints, such areas shall be coated prior to making the joint. The Contractor shall perform such excavation as is necessary for the installation of culvert, all as indicated on the drawings. Excavated materials shall be utilized in the backfill or embankment or shall be disposed of as specified in SECTION 02225, paragraph 3.2.

## 3.2 BACKFILL

### 3.2.1 General

Backfill shall be placed around and over the culvert pipes to the line and grade indicated on the drawings and/or as directed by the Contracting Officer. Backfill material shall be obtained from the required excavations, and shall be free from roots, muck, brush and other objectionable matter. Material used within 2 feet of the pipes shall consist of cohesive material. The Contractor will be required, when directed, to remove any materials which the Contracting Officer considers to be objectionable in the backfill. Frozen material shall not be placed in the backfill nor shall material be placed upon frozen foundations. The suitability of each section of the foundation for placing materials thereon will be determined by the Contracting Officer.

### 3.2.2 Compacted Backfill

Backfill material within 2 feet of the pipe shall be placed concurrently on each side of the pipe in layers not more than 6 inches in thickness prior to compaction. In placing and compacting the material, care shall be taken to insure that the backfill is rammed tight against the pipe at all points. Compaction within 2 feet of culvert pipe shall be accomplished by the use of approved mechanical hand tampers. Each layer of backfill shall be compacted to a density of at least 95 percent of the laboratory density obtained by the standard density test (ASTM D 698), Method D. The field density determination shall be by the Sand-Cone Method (ASTM D 1556) or by the Nuclear Method (ASTM D 2922). The moisture content after compaction shall be within the limits of 2 percentage points above optimum and 3 percentage points below optimum moisture content as determined in accordance with ASTM D 698. The materials may require moistening or aerifying as necessary to provide the above specified moisture content. The Contractor shall perform standard compaction tests to determine optimum water content and maximum densities and will perform field density and water content tests as assurance checks; the Contractor shall perform field density and water content tests on each layer of material placed to assure that proper compaction is being achieved.

--End of Section--

DIVISION 2 - SITE WORK

SECTION 02708

RELIEF WELLS

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SECTION 02708

RELIEF WELLS

PART 1 GENERAL

1.1 SCOPE

The work provided for herein consists of furnishing all plant, labor, material and equipment, and performing all operations required for proper execution of the relief well work as specified herein and/or indicated on the drawings. Such work includes installation of new relief wells; relief well outlets; guard posts; pump testing new wells; pilot hole borings and all work incidental thereto.

1.2 QUALITY CONTROL

(1) General

The Contractor shall perform the inspection, sampling and testing, corrective actions, and reports required to substantiate his compliance with the technical provisions of this specification. Responsibility for quality control of relief well construction, rehabilitation, sampling and testing procedures shall be the Contractor's. The Contractor's quality control organization shall have personnel sufficient in number to monitor at all times the relief well activities.

(2) Inspection

The Contractor's quality control organization shall be responsible to observe and control for compliance to technical specifications all relief well operations including but not limited to the following: survey layout, materials, drilling method, joints, bottom plug, materials storage, well pipe assembly and installation, backfilling, cleaning, development, pumps, pump testing, installation of outlets, chemical treatment, environmental compliance and safety. Completed relief wells shall be protected against damage and contamination. The detailed inspection may be assigned to the construction foreman supervising the work.

(3) Sampling and Testing

The Contractor's quality control organization shall verify that the well pipe material and manufacturing conforms to the specifications before delivery to the project. The particle size distribution of the gravel pack shall be tested by laboratories validated by U.S Army Corps of Engineers using the U. S. Standard Sieves described in paragraph 2.3. Two representative samples shall be taken from each dump truck load of gravel pack delivered to the project site and shall be tested for particle size distribution. The labs performing the particle size distribution tests shall be validated and meet all requirements as specified in Section 01451 paragraph 3.7.2

Testing Laboratories. The gravel pack material being tested shall be stored separately from the approved stockpile until results of the gradation test results are obtained and indicate that the gravel pack meets the specified requirements. Only approved gravel pack material will be allowed for placement in the relief wells. The laboratory test procedure shall conform to that presented in EM 1110-2-1906, Appendix V, a copy of which will be furnished the Contractor upon request. A pumping and sand infiltration test and alignment and plumbness test shall be performed in accordance with technical provisions herein specified.

#### (4) Action Required

When quality control monitoring or testing detects non-conformance with specifications, corrective action shall be taken immediately. The details of the irregularities and the actions taken to correct them shall be reported immediately to the representative of the Contracting Officer and included in the daily Quality Control report. Also, corrective action shall include steps taken to prevent recurrence of the irregularity.

#### (5) Reports

Reports shall include, for each new relief well, LMM 650 Jan '64 "Field Boring Log", WES Form 797 "Relief Well Installation Report," WES Form 796, "Relief Well Pumping Test Report", "Well Development Data Sheet" and the completed form for the sanding test results. The gradation curves for the gravel pack material shall be submitted on ENG Form 2087, "Gradation Curves" with all gravel pack filter material being approved before placing around each relief well. The Contractor shall provide sieve analysis data through a Microsoft Excel spreadsheet provided by the Memphis District for each boring. A copy of each report form is attached at the end of this section. The elevation of changes between materials on these reports shall be to the nearest 0.1 foot. Data concerning installation and development of the relief well shall be included in the report on relief well installation. The pump test report shall include the time pumped and rate of flow, the draw down response data of the pumped well, and the amount of sand produced by the well during pumping. The reports shall be completely filled out and shall be submitted to the Contracting Officer as part of the daily quality control report specified in the Special Contract Requirements. A copy of these records and tests as well as the records of corrective action taken, shall be furnished to the Government.

#### (6) Licenses and Permits

The contractor shall be responsible for obtaining and having on site all licenses and permits required to meet all state and/or federal requirements needed to install relief wells in the particular state or states for the proposed relief wells as stated for this project. Submit a copy of each permit and license the Contracting Officer for information.

### 1.3 APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to elsewhere in this section by basic designation only, form a part of this specification to the extent indicated by the references thereto:

American Society for Testing and Materials (ASTM).

A 53-90b	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and seamless
A 276-94b	Stainless and Heat Resisting Steel Bars and Shapes
A 312/A312M-94b	Seamless and Welded Austenitic Stainless Steel Pipes
A 555/A555M-94	General Requirements for Stainless Steel Wire and Wire Rods
C-117-95	Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
C-136-95a	Sieve Analysis of Fine and Coarse Aggregates
D-1586-84	Penetration Test and Split-Barrel Sampling of Soils (R 1992)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) WITH CORRESPONDING CRD STANDARD INDICATED WHERE AVAILABLE.

C 31-96 (CRD-C 11)	Making and Curing Concrete Test Specimens in the Field
C 33-93 (CRD-C 133)	Concrete Aggregates
C 39-96  (CRD-C 14)	Compressive Strength of Cylindrical Concrete Specimens
C 94-96 (CRD-C 31)	Ready-Mixed Concrete
C 150-92 (CRD-C 201)	Portland Cement
C 171-97 (CRD-C 310)	Sheet Materials for Curing Concrete
C 172-90 (CRD-C 4)	Sampling Freshly Mixed Concrete

C 231-97

Air Content of Freshly Mixed Concrete by the  
Pressure Method

The Aluminum Association (AA) Specifications.

Specifications for Aluminum Structures Available from: Aluminum Association, Inc.,  
818 Connecticut Avenue, NW Washington, D.C. 20006

Federal Specifications (Fed. Spec.).

TT-E-489H

Enamel, Alkyd, Gloss Low VOC content

Steel Structures Painting Council specifications (SSPC).

SSPC-Paint 25

Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and  
Alkyd Primer

Department of the Army, Corps of Engineers, Engineer Manual.

EM 1110-2-1906

Laboratory Soils Testing, 1 May 1980

## PART 2 PRODUCTS

### 2.1 WELL SCREEN

#### 2.1.1 General

Well screen shall be stainless steel and shall be of the dimensions hereinafter specified. The inside diameter of the screen shall be not less than 8 inches. Screen openings shall be uniform in size and pattern, and shall be spaced approximately equally around the circumference of the pipe. Before installation, all well screens shall be approved by the Contracting Officer.

#### 2.1.2 Stainless Steel

##### 2.1.2.1 General

Stainless steel well screen shall be a non-clogging wire-wrapped continuous slot strainer. All pipes, rods, bars, and wire shall be stainless steel conforming to ASTM A 276, A 312 or A 555 for Grade TP-304 as applicable. The width of the clear space between the wire wrappings for the 8-inch wells shall be 0.08 inch and shall provide a total opening of not less than 150 square inches per foot of 8 inch diameter screen. The screen shall have a minimum clear inside diameter of 8 inches.

##### 2.1.2.2 Coupling

Couplings for stainless steel well screen shall consist of the same material as the well screen and shall be welded joint couplings. Connections between the well screen and the riser pipe shall be threaded connections or welded joint couplings. If welded connections are used, end fittings for stainless steel well screens shall be suitably beveled and furnished with welding rings of the same alloy as the well screen and riser pipe. Welding rings that join well screen to riser pipe shall adequately provide for the transition from well screen to riser pipe. Joints in riser pipe shall be single or double bevel welded and shall have strengths equal to the pipe being joined. Deposited weld metal shall have a resistance to corrosion equal to or greater than that of the pipe used. Joints shall be designed and constructed to support the weight of the screen and/or pipe as it is lowered into the hole. Welding shall be performed by a certified welder using approved welding rods, and performed in a manner which will not cause the screen sections to deviate from a straight alignment.

#### 2.1.3 Bottom Plug for Well Screen

The bottom plug for each well screen shall be made of the same material and at least the same minimum thickness as the riser pipe. Plugs shall be the same diameter as the outside of the screen and fastened to the bottom of the screen in an approved manner.

## 2.2 RISER PIPE

The relief well riser pipe material and method of manufacture shall conform to the requirements specified in paragraph 2.1.2 above and shall be schedule 10 wall thickness. The relief well riser pipe shall have a minimum inside diameter of 8 inches. Discharge details shall be as shown on the drawings. Couplings to the well screen and between riser pipe sections shall be as specified for well screen pipes.

## 2.3 GRAVEL PACK

Material for the gravel pack around the riser pipes and screens shall be washed gravel composed of hard, tough, durable particles free from adherent coating. Limestone, dolomite, or carbonate materials will not be acceptable materials. The gravel pack material shall contain neither detrimental quantities of vegetable matter nor soft, friable, thin, or elongated particles. The gravel pack shall meet the following gradation requirements:

<u>U. S. Standard Sieve No.</u>	<u>Percent by Weight Passing</u>
<u>1/2 inch</u>	<u>100</u>
<u>3/8 inch</u>	<u>95-100</u>
<u>No. 4</u>	<u>70-85</u>
<u>No. 8</u>	<u>27-45</u>
<u>No. 16</u>	<u>0-10</u>
<u>No. 30</u>	<u>0-1</u>

Materials shall be uniformly graded between the limits specified above. All points on individual grading curves obtained from representative samples of gravel pack material shall lie between the boundary limits as defined by smooth curves drawn through the tabulated grading limits plotted on a mechanical analysis diagram. The individual grading curves within these limits shall not exhibit abrupt changes in slope denoting skip grading, scalping of certain sizes or other irregularities that would be detrimental to the proper functioning of the gravel pack. For each relief well the gravel pack material and its gradation shall be approved before it is placed. The filter gravel pack material shall be pre-approved by the Contracting Officer from the source quarry and meet the requirements of these specifications before individual truck loads of material shall be delivered to the project site.

## 2.4 SAND

Sand placed on top of the gravel packing shall conform to fine aggregate for concrete as specified in ASTM C 33.

## 2.5 GROUT

Grout mix placed on top of the sand shall consist of 1 bag (94 lbs) of cement to 5 gallons of water. It shall have a bentonite-cement ratio of 1 part bentonite to 30 parts cement.

## 2.6 OUTLET FOR RELIEF WELL

### 2.6.1 Well Guard

Each outlet shall consist of a metal well guard as shown on the drawings. The well guard shall consist of a section of 20-inch outside diameter stainless steel well screen constructed using the wire-wrapped continuous slot design method. The well guard shall be fabricated by circumferentially wrapping a triangularly shaped wire around a circular array of internal bars on 1-inch centers. The wire configuration must produce inlet slots with sharp outer edges, widening inwardly so as to minimize clogging. For maximum collapse strength each juncture between the horizontal wire and the vertical bars will be fusion welded under water by the electrical resistance method. The minimum wire/weld strength shall be 650 lb. The well guard and attached fittings shall be completely fabricated of stainless steel conforming to ASTM A 555, Grade TP 304. The width of the clear space between the wire wrappings shall be 0.250 inch. The wire wrappings shall be composed of "190" wire. The surface of the well guard shall be free of pits, slag and discoloration. All welds shall be ground and brushed.

### 2.6.2 Cover Plate

The cover plate and fittings shall be fabricated of stainless steel conforming to ASTM A 276, Grade TP 304. The plate shall be 1/4-inch in thickness and shall have a diameter of 21 inches. The cover plate shall be attached to the well guard using 3/8-inch socket head cap screws. A slotted lug shall be welded on the well screen to serve as a hinge and to prevent removal of the cover plate.

### 2.6.3 Check Valves

The aluminum check valves shall be fabricated in accordance with details shown on the drawings and as specified herein. The aluminum parts, at the Contractor's option, may be any one or a combination of aluminum alloys 3005-H14, 6061-T4, or T6. Rods shall be carefully bent to avoid flattening at the bends. The seat for the check valve is to be constructed of two 1/4-inch aluminum plates and a 1/4-inch thick silicone sponge rubber gasket, all bolted together as indicated on the drawings. Drilling or punching the aluminum plates and silicone sponge rubber gasket shall form the bolt holes. The silicone sponge rubber gasket shall have a thickness of 1/4 inch and shall be fabricated from silicone sponge rubber gasket material. The aluminum guide rods and aluminum lifting ring shall be connected by welding. Welding of aluminum shall conform to the applicable provisions of the AA Specifications for Aluminum Structures.

### 2.6.4 Angular Face Ring

An angular face ring shall be fabricated or purchased from a supplier conforming to ASTM A 276, Grade TP 304L or 316L stainless steel as shown on the drawings and the flange shall be a minimum of 3/16-inch in thickness. The angular face ring shall be at least the same diameter or slightly larger than the aluminum top plate of the check valve as shown on the drawing.

## 2.7 RELIEF WELL GUARD POSTS

Steel pipe shall be black steel pipe conforming to the requirements of ASTM A 53, Schedule 40. Concrete shall conform to the requirements of paragraph 2.8 below. After installation, the aboveground portions of the pipe guard posts shall be given one coat of paint conforming to the requirements of SSPC-Paint 25, followed by two coats of yellow paint conforming to the requirements of Fed. Spec. TT-E-489, the specific color to be selected by the Contracting Officer.

## 2.8 CONCRETE

Concrete shall conform to the requirements of ASTM C 31, C 33, C 39, C 94, C 150, C 171, C 172, AND C 231. Concrete shall have a minimum compressive strength of 4,000 psi. Concrete shall consist of one part Portland cement; two parts clean, washed sand; three parts of 1-inch maximum size, clean, well-graded, hard-surfaced coarse aggregate; a suitable air-entraining admixture; and sufficient water to produce a slump between 1 and four inches. Entrained air shall be 6 (six) percent, plus or minus 1-1/2 percent. The concrete shall be mixed in a manner so as to produce a mixture having a consistency that will permit placement as indicated on the drawings. Concrete mixed at the job site shall be used in the work within 45 minutes after mixing. Concrete mixed at a commercial mixing plant and transported to the job site in trucks shall be used in the work within 1-1/2 hours after mixing. Retempering of concrete will not be allowed. Concrete shall not be placed when the ambient temperature is below 40 degrees F or above 85 degrees F unless otherwise approved by the Contracting Officer in writing; nor when the concrete, without special protection, is likely to be subjected to freezing temperatures before final set has occurred. Prior to placing concrete, all surfaces upon which the concrete is to be placed or placed against, shall be wetted. Concrete shall be thoroughly consolidated after placement by suitable vibrators or by rodding. Concrete shall be given a trowel finish and shall be cured by keeping the surface continuously wet for a period of not less than 72 hours or by application of an approved curing compound. Submittals shall conform to the requirements of Section 01330.

## 2.9 DRILLING FLUID ADDITIVE

The drilling fluid (not a bentonite or other expansive clay system) shall be a suspension of fine-grained soil or shall be a commercial product of a recognized manufacturer. Drilling fluid additives intended for use shall be submitted to the contracting Officer prior to use. The drilling fluid shall have the characteristic of being readily removable from the gravel pack and the walls of the formation by development methods as specified in paragraph 3.8.

## PART 3 EXECUTION

### 3.1 GENERAL – NEW RELIEF WELLS

#### 3.1.1 Shop Drawings and Field Procedures

The Contractor shall submit shop drawings which present details of his methods for drilling, coupling well screen and riser sections together, installing the well screen and riser, backfilling, developing and pump testing the well. The shop drawings shall show the well screen material, size, perforation size, shape and pattern and bottom plug material and installation detail. Also, the riser pipe and well discharge details shall be shown on the shop drawings. Any Contractor proposed substitutes or alternates in material, construction details, or methods must be presented in the shop drawings. No phase of the work shall be initiated until all shop drawings concerning that activity, have been approved.

#### 3.1.2 Location

The location and elevation requirements for the wells are shown on the drawings. The location for each well shall be clearly staked and identified by number and elevation in the field. The results of the survey shall be submitted to the Memphis District Geotechnical Engineering Branch. The location of the wells may be field adjusted by the Contracting Officer. The top of the relief wells shall be installed no higher than the maximum elevation for each well as shown on the drawings except as directed by the Contracting Officer.

#### 3.1.3 Depth-of-Well

The length of well screen and length of riser pipe shall conform to the elevations shown on the drawings and to the final design as presented after the pilot hole boring data has been furnished and evaluated.

### 3.2 PILOT HOLE BORINGS

#### 3.2.1 Location

Prior to drilling the relief wells, the Contractor shall drill a pilot hole at each well location indicated on the drawings and at any additional locations determined necessary by the Contracting Officer. A wooden survey stake marked with well number and existing ground elevation shall identify each pilot hole location and shall be of sufficient height to be easily seen in the field. Prior to commencement of pilot hole borings, the staked out locations of the pilot holes may be field adjusted by the Contracting Officer. The elevation of the existing ground surface at the pilot hole locations shall be surveyed by the contractor and submitted to the Memphis District Geotechnical Engineering Branch along with the results of the pilot hole sieve analyses data. Upon completion of the pilot hole, the survey stake shall be placed as close as feasible to the location at which the boring was taken. The pilot holes shall be located within 5 feet of the well locations.

### 3.2.2 Method

Pilot holes may be drilled by any method approved by the Contracting Officer which will allow the recovery of samples as described below. Samples shall be obtained with a standard split spoon sampler, (inside diameter of 1-3/8 inch), and shall be driven by any method approved by the Contracting Officer to obtain samples 18 inches in length. Blow counts will not be required unless as specified below. Drilling fluid additives shall be as specified in paragraph 2.9.

### 3.2.3 Intervals

Pilot holes shall be continuously drilled to an elevation 10 feet above the approximate elevation of the bottom of the riser pipe as shown in the drawings as measured from the ground surface. Sampling shall begin at this elevation unless sand is encountered during the continuous drilling of the hole. If sand is encountered, then sampling shall begin at the clay/sand interface. Samples shall be taken at 2-1/2 foot intervals or change of strata, whichever occurs first for the next 40 feet of each pilot hole. After 40 feet of sampling, the sampling interval shall change to every 5 feet for the remainder of the hole. The bottom elevation of the pilot holes shall be (15) feet below the elevation of the bottom of the well screen as indicated on the drawings, as applicable to each well location.

### 3.2.4 Sampling

Samples shall be taken at 18 inches lengths in the intervals described above. However, samples may be removed less than 18 inches if the total blow counts for the sample reaches 180. If samples are removed before reaching 18 inches in length due to the maximum blow count per sample, then the blow counts shall be documented by the driller.

### 3.2.5 Testing

Beginning with the first non-cohesive sample, all samples shall be washed in accordance with ASTM C 117 and shall undergo a sieve analysis test in conformance with ASTM C 136. Samples taken shall assist in determining the elevation at which the well screen and riser pipe shall be set and to assist in confirming the possible location of blank areas.

### 3.2.6 Documentation

A field-boring log shall be maintained for each pilot hole drilled. This data shall be recorded on Form LMM 650 Jan '64 "Field Boring Log", a copy of which is attached at the end of this section. The Contractor shall submit the logs of the pilot borings, the samples and results of sieve analysis tests obtained from the pilot borings with the depths from which samples were obtained, the elevations at which soil strata changes occur, and any other information available from the pilot boring to the Contracting Officer. The Contracting Officer shall then make a determination as to the lengths and locations of well screen, blank pipes between screen sections and riser pipe to be installed in each well. The Contractor shall provide the sieve analyses data through a Microsoft Excel spreadsheet provided by the Memphis District for each boring. The testing laboratory shall retain a portion of each unwashed sieve sample that exceeds the amount required

to perform testing in accordance to ASTM C 117 and C 136 for future test verification. This small sample must be retained until all sieve data has been reviewed by the Memphis District. A copy of each sieve analysis results shall be emailed to representatives from both the Memphis District Geotechnical Engineering Branch and the Wynne Area Office. E-mail addresses will be provided during pre-work conferences. After receipt of the required information from the pilot hole described above, the Contracting Officer will make a determination and convey it to the Contractor within 10 working days. Lengths and locations of screen and riser pipe shall be approximately as shown on the drawings but will be subject to change based on the results of the sieve analysis from the pilot hole boring data.

### 3.3 DRILLING

#### 3.3.1 General

Wells shall be drilled by the reverse rotary method, in such a manner to insure proper placement of the well screen, riser pipe and gravel pack. Methods which involve radical displacement of the formation, or which may reduce the yield of the well, will not be permitted. Only drilling fluid additives approved by the contracting officer may used for drilling. However, the use of a bentonitic type drilling fluid is prohibited. Drilling and installation of well screen and gravel pack shall be completed for each well without interruption. Excavated material shall be disposed of as directed by the Contracting Officer. Before drilling operation begins on each well, the Contractor shall demonstrate that all material, equipment, and experienced personnel are mobilized and that all equipment necessary for the job is adequate for an efficient operation and is operating in a satisfactory manner. Loss of a hole or well because of lack of material, inadequate or faulty equipment, or careless operating procedures will be considered cause for an abandoned well due to fault or negligence of the Contractor.

#### 3.3.2 Reverse Rotary Method

The diameter of the hole shall be such as shall permit the placement of the minimum thickness of gravel pack as specified in paragraph 2.3. If the walls of the hole above the top of the gravel pack require support during development operations, a temporary casing similar to that specified in paragraph 3.3.3 shall be placed so as to extend from the ground surface to at least three feet below the top of the gravel pack material. Drilling fluid additives, if used, shall be as specified in paragraph 2.9.

#### 3.3.3 Temporary Casing

A temporary well casing of either iron or steel, new or used, may be used to support the sides of the entire hole during drilling and placement of screen, riser pipe, and gravel pack and to support the sides of the unbackfilled portion of the hole during development of the well. Any temporary casing shall have an inside diameter large enough to provide the minimum gravel pack thickness, as specified in paragraph 3.5, entirely around the well screen or riser pipe and shall have sufficient thickness to retain its shape and maintain a true section throughout its depth, and may be in sections of any convenient length. The temporary casing shall be securely anchored to the drill rig or ground surface at all times until removed. The temporary casing shall be such as to

permit its removal without interfering with the gravel pack or riser pipe. Methods of installation that will create a cavity outside the temporary casing will not be permitted.

### 3.3.4 Obstructions Encountered

If obstructions are encountered in the foundation which, in the opinion of the Contracting Officer, render it impracticable to complete the well to the directed depth, the Contracting Officer may adjust the depth to conform to that of the obstruction. Alternatively, the Contracting Officer may direct the Contractor to abandon the well, plug the hole by backfilling in accordance with paragraph 3.12 and construct another well at an adjacent site. The Contractor shall be required to provide and use drills and equipment that are capable of drilling through insitu wood deposits within the alluvium and capable of removing cobbles up to 5-1/2 inches in diameter. The presence of cobbles up to 5-1/2 inches in diameter or insitu wood that may be encountered during drilling shall not be considered as obstructions or sufficient reason for abandonment of a well. Where obstructions are encountered, drilling shall be continued until it is demonstrated to the Contracting Officer that further efforts to advance the drill hole are impracticable. Such demonstration shall include, but not be limited to, continuing drilling operations when no gain in depth is being made for a minimum of 15 minutes. Wells which are abandoned because of impracticability of completion to the desired depth will be paid for as specified in SECTION 01025, paragraph 1.2.1 (2), except that payment will not be made if abandoned because of faulty operation or neglect of the Contractor.

## 3.4 INSTALLATION OF RISER PIPE AND SCREEN

### 3.4.1 Assembly

All riser pipe and screen shall be new and in good condition before installation and all couplings and other accessory parts shall be securely fastened in place. The successive lengths of pipe shall be arranged to provide accurate placement of the screen sections in the soil strata. The use of lengths of screen and riser shorter than 15-ft. long will not be permitted unless previously approved by the Contracting Officer.

The bottom of the screen and riser assembly shall be equipped with an appropriate centering guide which will satisfactorily center the assembly in the hole and hold it securely in position while the gravel pack material is being placed. The centering guide should be placed on the bottom of the screen and have a minimum diameter no less than 1-1/2 inches of the diameter of the drilled hole and ensure minimum clearance needed for placement of the gravel pack. The centering guide or guides should be designed and attached so that natural material removed from the sides of the drilled hole during installation shall be at a minimum. Centering guides, also at a minimum diameter of 1-1/2 inches less than the diameter of the drilled hole, may be placed at other locations along the screen and riser pipe assembly provided they do not interfere with placement of gravel pack material as specified in paragraph 3.5. If a centering guide apparatus or ring is used for placement of the gravel pack that will slip around the well screen and riser pipe, then the guide apparatus shall also have a minimum diameter of 1 and 1/2 inches less than the diameter of the drilled hole (or on all four sides) ensuring correct alignment along the entire length of the relief well.

### 3.4.2 Joints

Sections of relief well pipe shall be jointed together as specified in paragraph 2.1.2.2. Joints shall be designed to provide strength capable of supporting the weight of the relief well stem as it is lowered into the hole.

### 3.4.3 Installation

The contractor will be required to install, develop and test at least 1 well to insure compliance with the specifications before installation of the 6th well is allowed. Results of all tests must be submitted to the Contracting Officer prior to beginning the installation process of the 6th well. The assembled riser pipe and screen shall be placed in the hole in such manner as to avoid jarring impacts and to insure that the assembly is centered and not damaged or disconnected. All mud and undesirable material shall be washed free of from the well screen prior to placing in the hole. After the screen and riser pipe have been placed, a gravel pack shall be constructed around the screen section as specified in paragraph 3.5 and the well developed as specified in paragraph 3.8. The top of the riser pipe shall be held at the designated elevation as shown on the drawings during placement of the gravel pack. Immediately after the installation of the well screen and riser pipe assembly, the depth of the well shall be measured by means of an approved sounding device.

### 3.4.4 Plumb and Alignment

Each well shall be installed and maintained straight and plumb during placement of gravel pack and development. Immediately before placing the gravel pack and with the top of the well fastened securely in a vertical and horizontal position, an alignment test shall be conducted in the presence of the Contracting Officer. Excessive misalignment or deviation from plumb shall be corrected before placing the gravel pack. The alignment test shall consist of two 10-ft. sections of standard 6-in. pipe coupled together with a 7.39-in. OD coupling lowered inside the well for the full depth of the well and withdrawn without binding against the sides of the well screen or riser pipe for 8-inch diameter wells. The Contractor shall furnish the above apparatus and shall perform the alignment tests. The Contractor shall notify the Contracting Officer a minimum of 8 working hours prior to performing the alignment tests. After completion of the alignment test, the Contracting Officer may elect to perform a plumb test before placement of the gravel pack. This test, if performed, will be at the expense of the Government using Contractor-furnished equipment and shall consist of a plumb-line run from the top of the well to the bottom of the well. A variation of up to 12-in. per 100-ft, will be permitted in the combined length of screen and riser pipe of the well. In the event the Contracting Officer elects to perform the plumb survey prior to gravel pack placement and the well fails to conform to the standard described above, the Contractor, at no additional expense to the Government, shall correct the plumb of the well. The Contractor shall provide assistance to the Contracting Officer in performing the plumb test, if requested.

### 3.5 PLACING GRAVEL PACK

#### 3.5.1 General

After the screen and riser pipes have been placed, and alignment surveys and plumb surveys (if performed) are conducted, the gravel packs shall be placed through two 4-in. I.D. tremies with no obstructions.

#### 3.5.2 Tremie Pipe

The tremie hopper shall be so constructed and balanced that gravel pack material will feed freely and equally to 2 tremie pipes located at 180 degrees on each side of the screen. Tremie pipe shall consist of equal 10-ft lengths of standard 4-in. pipe with 1/16-in. wide equally spaced slotted openings. Connections between the tremie pipe and the hopper shall be designed for quick connection or disconnection for adding or removing tremie pipe with least possible delay. Tremie pipe shall contain no dents, flat spots, damaged threads, or holes, and shall be reamed and/or deburred to full I.D. of the pipe.

#### 3.5.3 Tremie Guide

The tremie guide shall consist of a metal ring or rings of sufficient inside diameter to slip freely over riser pipe and screen with 4-inch collars welded to the guide at 180 degrees to securely hold the tremie pipe in place. If this metal ring/rings or apparatus is also used as a centering device for correct alignment of the relief wells, then the ring/rings or apparatus shall have a minimum outside diameter of 1-1/2 inches less than the diameter of the drilled hole for each well. This apparatus does not have to be continuous in diameter around the relief well pipe but shall have the minimum clearance on all four sides ensuring that the relief well pipe will be centered in the hole and the gravel pack will be evenly distributed around the pipe. At no time shall tremie guide or pipes be raised, lowered or supported by only 1 pipe.

#### 3.5.4 Gravel Pack Placement (Gravity)

Prior to and during placement of the gravel pack, the top of the temporary casing or hole shall be covered or otherwise shielded to prevent the gravel pack from entering the space around the well except through the tremie pipe. No material shall be allowed to enter the well except through the tremie pipes. The Contractor shall be equipped to efficiently add gravel pack material to the hopper in any position from the ground surface to the maximum height of the hopper. The tremie pipe shall be installed to a length of 10 feet below the lower tremie guide. The gravel pack material shall be placed in an approved manner and without significant segregation. The gravel pack shall have a minimum thickness of 6 in. between the outside of the well screen and the outside of the gravel pack and shall be placed above the top of the well screen to the level shown on the drawings. At the commencement of placing operation, the tremie shall rest on the bottom of the hole and it shall be filled with gravel pack material. The tremie shall then be raised in increments approximately equal to the increments of the gravel pack placed. At all times during the placing of the gravel pack, the tremie pipe shall be kept filled with gravel to five (5) feet above the top of the well.

### 3.5.5 Gravel Pack Placement (Pumping)

The filter material may be pumped into the well using two 4-inch tremies with no obstruction as stated above provided the Contractor can pump the gravel pack without significant segregation of the gravel pack material and can pump in a continuous manner. A plan shall be submitted to the Contracting Officer and, if approved, a well shall be installed and tested before production installation proceeds.

### 3.5.6 Temporary Casing

If temporary casing is used, the gravel pack shall be placed in increments not to exceed 2 feet; the tremie and temporary casing shall be raised in small increments approximately equal to the increments of the gravel pack placed, except that at no time prior to the completion of placement of the gravel pack shall the bottom of the casing be less than 1 foot below the top of the gravel pack in the hole. The Contractor shall provide a means of measuring the gravel pack in the hole and also provide a means of measuring the gravel pack depth. The alternate placing of gravel pack material and withdrawing of the tremie and temporary casing shall be continued until the gravel pack has been placed to the level shown on the drawings.

## 3.6 INSTALLATION OF ANGULAR FACE RING

The riser pipe shall be cut at the specified elevation for each relief well or 4-inches above the top of the concrete slab. The cut shall be square, smooth and even along the top of the riser pipe. The angular face ring shall be welded to the top of the riser pipe with the top of the ring 1/4-inch above the smooth cut on the riser pipe. The weld shall be a continuous weld along the inside of the angular face ring along the top of the riser pipe. The finished product shall result in a smooth surface with no rough edges and provide continuous support between the silicone sponge rubber gasket of the check valve and top of the angular face ring.

## 3.7 INSTALLATION OF CHECK VALVE

The top of the riser pipe for each well shall be fitted with an aluminum check valve. The check valve and/or a temporary cover as approved by the Contracting Officer shall be installed on top of the riser pipe immediately after installation of the riser pipe and filter gravel. The temporary cover as approved shall be used during the installation and development process only. The aluminum check valve or temporary cover shall remain in place at all times throughout the well installation and development process to prevent possible contamination or damage to the well. The only time the check valve or temporary cover shall be removed will be during pumping, development and cleaning operations. The aluminum guide rods shall also slide freely up and down inside the riser pipe and shall be dimensioned as shown on the drawings to ensure proper seating of the check valve for the life of the relief well. The installation of the check valve shall be inspected and approved by the Contracting Officer prior to installation of each relief well outlet.

## 3.8 DEVELOPMENT

### 3.8.1 General

Following placement of gravel pack materials, the Contractor shall develop the relief well to remove all fines from the well and gravel pack so as to produce a stable well of maximum efficiency. Well development shall consist of chemical treatment, mechanical development (surging) and pumping. The Contractor will start the well development and testing process no later than 5 days from the installation of well screen riser and gravel pack. The Contractor shall be responsible for maintaining at the relief well the needed access and work area and clearance in the relief well necessary to accomplish development. The Contractor shall furnish, install or construct the necessary discharge line and troughs to conduct and dispose of the discharge a sufficient distance from the work area to prevent damage. Development shall be conducted to achieve a stable well of maximum efficiency and shall be continued until little or no additional material from the foundation can be pulled through the gravel pack. After each development cycle, gravel pack material shall be added to the annular space around the screen to maintain the top elevation of the gravel pack to the specified elevation. The Contractor shall provide a bubbler tube or other approved means for accurately determining the water level in the well under all conditions.

If, at any time during the development process, it becomes apparent in the opinion of the Contracting Officer that the well may be damaged, development operations shall be immediately curtailed. The Contracting Officer may require a change in method if the method selected does not accomplish the desired results. The Contracting Officer may order that wells that continue to produce excessive amounts of fines after development be abandoned, plugged, and backfilled, and may require the Contractor to construct new wells nearby. All materials that may have entered the well during the placement of the gravel pack or pulled into the well by the development process shall be removed prior to each development cycle and pumping test.

Drainage shall be provided prior to any pump testing or development of constructed wells. Any water discharged during the development process must be conveyed by way of collector ditches and outlet ditches. At no time shall the water be directly discharged on adjacent lands outside of the right of way.

### 3.8.2 Chemicals

To assist in dispersing and removing fines and drilling fluid from the walls of the drilled hole and from the gravel pack, chemicals shall be added to the well between 24 and 36 hours before development of the relief well. Following initial installation of the well screen and riser assembly and placement of the gravel pack and cleanout of the well, calcium hypochlorite (example: HTH) with a minimum of 70 percent available chlorine in the amount of 1 pound per 100 gallons of water in the well shall be dissolved in water and poured into the well. The chemicals shall be mixed in the well by slowly injecting compressed air at the bottom of the well for a period of 2 hours or by other methods as approved by the Contracting Officer. No discharge from the well shall be allowed during mixing. The chemicals in the well shall be agitated by the

method described above for two hours at 8-hour intervals with the last agitation being immediately prior to initiation of development of the relief well.

### 3.8.3 Surge Blocks

Surge blocks shall consist of two groups of neoprene rubber circular disks spaced 4 feet apart and held in place by washers and spacers. Each group of disks shall consist of a one-inch thick, seven-inch diameter rubber disk, with a one-inch thick, six-inch diameter rubber disk on either side for 8 inch wells. This combination of rubber disks shall be fixed between rigid washers 2-1/2- to 3-1/2-inches in diameter. The entire assembly shall be rigidly attached to the end of a drill stem or pipe of sufficient mass to cause it to fall free on the downward stroke. The disks shall be replaced whenever they become worn. The Government may require the Contractor to vary the number of disks and increase the rigid washers to a diameter to 4-inches to result in the most effective surging action and yet be flexible enough to prevent damage to the well. The Government may also require the Contractor to make other minor changes in the design of the surge block as the work proceeds in order to accomplish a more thorough surging action without damage to the well. The surge block shall be operated by equipment capable of varying speeds over the full depth of the wells. The equipment shall be capable of traversing and maintaining the velocity of surge block travel along the well screen at a rate between 1-1/2 and 3 feet per second in both down and up directions.

### 3.8.4 Procedure

#### 3.8.4.1 General

At the time of development of any relief well, the well shall be free of draw down or surcharge effects due to pump testing, developing or drilling at another location. The static water surface in the well shall not be lowered below the top of the screen during development operations unless permission is given by the Contracting Officer. Development of wells shall not commence until drilling additives allowed by paragraph 3.3.2 (if used) have completely broken down and the chemical treatment specified in paragraph 3.8.2 has been completed.

#### 3.8.4.2 Surge Block Process

Immediately following completion of the specified chemical treatment, the Contractor shall measure the depth of the well and record the well depth to the nearest .10-foot. This measurement shall be compared with the actual depth of the well to determine if there is any material that has settled to the bottom during the chemical operations. The Contractor shall perform sufficient cycles of development until little or no sand can be pulled into the well but must complete three cycles per well as a minimum. Each cycle shall consist of one phase of surging and one of air pumping to remove infiltrated material. The well shall be surged at a rate of between 1-1/2 to 3 feet per second along the well screen and in a manner such that the surge block shall not impact the bottom of the well. Surging shall proceed for a minimum of 60 minutes per phase. The Contractor shall make continuous adjustments in the length of travel of the surge block to avoid impacting the surge block on the bottom of the well. Development shall begin above the screen and move progressively downward to prevent the surge block from

becoming sand locked. The initial surging motion should be relatively gentle and begin in the riser pipe 10 to 15 feet below the static water level. After waiting 5 minutes following completion of each surging phase, the Contractor shall measure and record to the nearest .10-foot, the depth to the top of any material that has been brought into the well and settled at the bottom. Upon completion of each surging phase the well shall be air pumped at a rate not to exceed 500 g.p.m. for a minimum of thirty minutes to remove sediment material. Other methods for removing sediment may be approved by the Contracting Officer.

#### 3.8.4.3 Intermittent Pumping

At the conclusion of the development process, the well shall be subjected to a period of intermittent pumping. This shall be performed by pumping the well at a capacity sufficient to produce a rapid draw down in the well of approximately 5- to 10-feet. The pump shall then be stopped. There shall be no backflow through the pump. The Contractor shall then permit the water surface to rise to its former elevation and then repeat the procedure. Cycle time for this procedure shall vary as directed but shall not be more than 3 cycles per minute. A turbine or centrifugal type pump shall be used with any attachment(s) necessary to accomplish rapid starting and stopping for intermittent pumping. The pump intake shall be set between 2 and 6 feet from the bottom of the well. The amount of draw down or rate of pumping during the intermittent pumping may be adjusted by the Contracting Officer if in the opinion of the Contracting Officer, the efficiency of the well might be positively affected. Intermittent pumping shall be continued for 1 hour after which time all material remaining in the well shall be removed. Before removal of sediment in the well, the contractor shall record the amount of sediment in the bottom of each well after each cycle of development and provide the information to the Contracting Officer.

#### 3.8.5 Data

As a minimum the following items related to well development shall be measured and recorded by the Contractor on the form included at the end of this section and entitled "Well Development Data". Development cycles where measurements and records are required include both the Surging and Intermittent Pumping operations.

Development Cycle Type.

Date and time of start and finish of the development cycle.

Depth of gravel pack before and after each development cycle.

Depth to bottom of well before and after each development cycle.

The amount of gravel pack added after each development cycle.

### 3.9 BACKFILLING

During the development of the well, the top of the gravel pack material shall be maintained at the level shown on the drawings. After the well has been developed and pump tested as stated below, the annular space above the gravel pack shall be backfilled by first placing a minimum 12-inch layer of sand, as specified in Part 2 PRODUCTS, on top of the gravel pack and then filling the remainder of the space up to the concrete slab with a grout mix as specified in Part 2 PRODUCTS. This grout mix shall be injected at the bottom of the annular space to be grouted under a maximum pressure of 10 psi. A concrete slab with concrete conforming to the requirements as specified in paragraph 2.8 shall be placed above the grout, as shown on the drawings. The temporary casing, if used, shall be withdrawn in increments as the grout is placed. The Contractor shall fill with impervious material to original grade all pits such as that incidental to the reverse rotary method of drilling. Construction of the relief well outlets or backfilling shall not commence until the development of the well is completed and the gravel pack has been placed to the elevation shown on the drawings.

### 3.10 PUMPING TESTS

#### 3.10.1 General

Upon completion of installation and development, and before final acceptance, each well shall be subjected to a pumping test. The test pumping and sand infiltration tests hereinafter specified may be performed before placement of the grout mix prescribed in paragraph 3.9, except that the concrete slab shall not be placed prior to completion of the pumping and sand infiltration tests. In no event shall the pumping tests be performed when the ground water table at the well is less than 10 feet above the top of the well screen. Prior to commencement of the pumping test, the Contractor shall provide approved means for accurately determining the water level in the well under all conditions. The Contractor shall furnish and install a flow meter of standard design for the purpose of measuring the discharge from the well during the pumping test. The Contractor shall furnish, install, or construct the necessary pipe discharge line, troughs, or ditches necessary to dispose of the pumping test discharge a sufficient distance from the work area to prevent damage. After completion of the test, the depth of the well shall be measured, by means of an approved method, under the direction of a representative of the Contracting Officer and the amount of sediment in the bottom of the well from the pump test shall be recorded.

#### 3.10.2 Equipment

##### 3.10.2.1 Pump

The Contractor shall provide a pump capable of producing the specified draw down over a period of time sufficient to satisfactorily perform the pumping test specified. The use of deep well pumps will be permitted provided that the pump itself is kept within the riser pipe, and the Contractor demonstrates the ability to comply with all specified requirements of pumping and sand measurement. The pump shall be complete with gasoline, diesel, or electric motor. In case an electric motor is used, the Contractor shall provide, without additional cost to the Govern-

ment, the electrical power and the necessary wiring which shall be removed by the contractor at the completion of the pumping test.

#### 3.10.2.2 Water Level

The Contractor shall provide means for accurately determining the water level in the well under all conditions. This means of measurement shall be capable of determining the water level in the wells before, during, and after pumping tests. The use of a weighted tape shall not be regarded as sufficiently accurate for such measurement.

#### 3.10.2.3 Flow Meter

The Contractor shall furnish and install a calibrated flow meter of standard design for the purpose of measuring the discharge from the well during the pumping test. The calibration of the flow meter shall be checked at periodic intervals.

#### 3.10.2.4 Sand Infiltration Measurement

A sand infiltration test shall be conducted for the purpose of determining whether sand and/or material is being removed from around the well when the well is discharging flow. The Contractor shall measure the amount of sand infiltration from each relief well during pump testing using a Rossum centrifugal sand sampler or an approved equal. The pump discharge line shall be equipped with the necessary fittings to properly conduct the test. The contractor's employee shall be experienced in conducting the sand infiltration test including placing the sampler at the proper location along the discharge line, calibrating the proper flow into the meter, and experienced in reading the amount of sand in the sampler. The sand infiltration test shall be conducted and monitored for a minimum of 30 minutes per pump test and shall begin within the first hour of the pumping test. If the amount of sand collected is less than the first readable unit of measure on the sampler, then a trace or an amount less than the minimum readable on the scale shall be recorded (do not try to estimate the amount of sand if it is not a readable amount). The attached sand infiltration test data sheet shall be filled out completely for each test conducted and furnished to the Contracting Officer. If the test fails and additional well development is required, then this information shall also be placed on the data sheet.

#### 3.10.3 Data

As a minimum the following test data items shall be obtained and recorded by the Contractor on WES Form 796 "Relief Well Pump Test Report", a copy of which is attached at the end of this section. The Contracting Officer shall check the last two items.

Time of observation.

Depth of water in well before, during, and after pumping.

Flow in gpm.

Elevation of water in well before and after pumping.

Elevation of water in adjacent wells or piezometers before and during pumping, when requested by the Contracting Officer.

The depth of sand in well before, during, and after pumping.

Amount of sand pumped out of well as recorded from the sand infiltration test.

#### 3.10.4 Procedure

The pumping and sand infiltration tests shall be conducted under the direction of the Contracting Officer. The Contractor shall test each well by pumping continuously for a minimum of two hours. Ground water level readings in the well and gallons pumped (on flow meter) shall be recorded at the end of each of the following intervals (in minutes): 1, 2, 3, 4, 5, 10, 15, 20, 25, 30, 45, 60, 75, 90, 105, 120, or as directed by Contracting Officer. The pumping shall be at a constant rate sufficient to produce either a draw down of 10 feet or a production of 500 gpm. No test pumping of a well will be permitted concurrently with drilling, surging, or pumping of any other well within 200 feet therefrom. In the event that the test is interrupted, other than by order of the Contracting Officer, prior to the completion of the specified period of continuous operations, the test shall be re-run at no additional expense to the Government. In addition to the test described above, the Contracting Officer may direct the Contractor to perform additional testing. Such additional testing shall conform in general to the requirements specified above with the exception that the Contracting Officer will determine the duration of the tests and the approximate draw down. The test, to be successful, shall be continuous throughout the specified period. In the event that sand or other material infiltrates into the well as a result of the pumping test, the following procedure will be followed: If the rate of sand infiltration during the latter part (last hour) of the two hour pumping test has not been reduced to 1 pint or less per 25,000 gallons pumped (5 parts per million, ppm), the well shall be resurged by manipulation of the test pump for 20 minutes after which the test pumping shall be resumed and shall be continued at the constant rate specified above until the sand infiltration rate is reduced to less than 1 pint per 25,000 gallons, but not for more than a total of eight hours. If at the end of eight hours of pumping the rate of infiltration of sand is more than 1 pint per 25,000 gallons pumped, the well shall be abandoned. However, the Contractor may continue the test pumping and perform such other approved remedial work, as he considers desirable, at his own expense. After such additional test pumping and other remedial measures, the sand infiltration rate of a well is reduced to not more than 1 pint per 25,000 gallons pumped, the well will be accepted. Upon completion of the pumping test, any sand or filter material in the bottom of the well shall be recorded and removed by pumping or by other approved methods, after which the Contractor shall remove all equipment, discharge lines, etc., and shall backfill any excavated areas. Abandoned wells shall be plugged in accordance with paragraph 3.12 below and a new well installed nearby.

### 3.10.5 Records

The Contractor shall obtain and furnish to the representative of the Contracting Officer for record purposes the elevation of the water in each well before and after the development pumping, the flow in gpm at the completion of the pumping and the time of observation. The water surface elevation shall be obtained immediately before starting the surge pump and the water surface elevations and flow shall be obtained just before stopping the pump upon completion of the development pumping. This data shall be recorded on WES Form 797, a copy of which is attached at the end of this section.

### 3.11 INSTALLATION OF GUARD POSTS

Upon completion of the relief well outlet structures for the new wells, the Contractor shall furnish and install three concrete filled steel pipe guard posts, anchored in concrete, around each well as indicated on the drawings. Paint shall be as specified in Products section of specification.

### 3.12 PLUGGING ABANDONED HOLES

New wells ordered abandoned by the Contracting Officer for any reason shall be filled with a neat cement grout as specified in paragraph 2.5. For wells ordered abandoned, the screen and riser pipe shall be salvaged from the hole, if possible. For wells ordered abandoned where the Contracting Officer determines that it is impossible or impractical to salvage the screen and riser pipe, the well shall be grouted with the screen and riser assembly in place. The riser pipe shall be removed for a minimum depth of two feet below natural ground. Once grout has been placed, the top 2 feet below natural ground shall be backfilled with cohesive soils. The grout shall be injected through a pipe with a tip within three feet of the bottom of the well and forced upwards towards the surface. When the grout reaches the surface, it shall be allowed to flow to waste until the Contracting Officer determines that the grouting has been satisfactorily accomplished. The grout shall be injected at a maximum pressure of 1/2 psi per foot of depth of the hole. The grout mix shall consist by weight of one part Portland Cement, 4 parts sand, 2 parts Bentonite and shall be mixed with sufficient water to provide a 6" to 8" slump.

### 3.13 EMERGENCY WELL CLOSURE DURING CONSTRUCTION

Well construction will not be permitted during periods of high groundwater, during periods prior to high predicted River stages and/or during other emergencies as directed by the Contracting Officer. All remediation measures will be directed by the Contracting Officer. Resulting delays will be compensated in accordance to the Default Clause. The Contractor or his representative shall be available at all times during any declared emergency. During periods of high groundwater or high river stages, the contracting officer may direct the Contractor to restrict all flow from the wells or may allow the completed/partially completed wells to flow without additional adjustments. If directed by the Contracting Officer, wells shall be plugged with a mechanical test plug to prevent flow from the wells. The mechanical test plug shall be a pipe stem test plug with a bypass, and shall be capable of withstanding maximum water pressures equivalent to 20 feet of head. The mechanical plugs will be provided by the Contractor at no

additional cost to the government. The Contracting Officer may also direct the Contractor to temporarily fill the space between the riser pipe and the drill hole for any partially completed well.

-- End of Section--



**DIVISION 2 - SITE WORK**

**SECTION 02936**

**ESTABLISHMENT OF TURF**

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**DIVISION 2 – SITE WORK**

**SECTION 02936**

**ESTABLISHMENT OF TURF**

**PART 1 GENERAL**

**1.1 SCOPE**

The work covered by this section consists of furnishing all plant, labor, equipment, and materials, and performing all operations necessary for establishment and mowing of turf on areas either as specified herein or as shown on the drawings.

**1.2 QUALITY CONTROL**

The Contractor shall establish and maintain quality control for turfing operations to assure compliance with the contract requirements and shall maintain records of his quality control for all construction operations, including, but not limited to, the following:

(1) Soil Testing

The tests are specified in paragraph 2.2.2 below.

(2) Preparation of Ground Surface

Location and quality of finish dressing, including necessary clearing, filling, or dressing out of washes, smoothness and uniformity of surfaces, and time of year.

(3) Fertilizing (and Liming)

Quality of materials, area fertilized (and limed), quantity applied, and method of application.

(4) Type of Turf

Quality, source, placing, covering, and compaction effort.

(5) Mulching (If Used)

Type of materials, area mulched, quantity applied, method of application.

## (6) Maintenance and Repair

Location and type of maintenance problems and remedial treatment performed.

## (7) Watering (If Used)

Quality of water, area watered, quantity applied, and method of application.

A copy of these records and tests, as well as the records of corrective action taken, shall be furnished the Government.

## 1.3 AREAS TO BE TURFED

Turf shall be established on all surfaces of the embankment placed under this contract, areas disturbed by haul roads, except on areas to receive other types of surfacing, and all other disturbed areas.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Fertilizer (and Limestone)

If the Contractor elects to use fertilizer, the fertilizer shall meet the requirements of the State of Arkansas for commercial fertilizer. Fertilizer shall consist of a mixture containing nitrogen, phosphorous, and potash, and shall be uniform in composition and free-flowing. The fertilizer may be delivered to the site in bags or other convenient containers or delivered in bulk. If delivered in bags or containers, the fertilizer shall be fully labeled in accordance with the applicable fertilizer laws of the State of Arkansas, and shall bear the name, tradename or trademark, and warranty of the producer. Should the commercial fertilizer be furnished in bulk, the Contractor shall furnish certified weight tickets and a certified quantitative analysis report, in triplicate, from a recognized testing laboratory certifying the nutrient ratio of the materials. In the event the commercial mixture is delivered to the job site in the original containers, unopened, the analysis report will not be required. Quantity of fertilizer (and lime), if used, required per acre shall be determined by certified soil tests as specified in paragraph 2.2.2 below. Limestone shall be approved agricultural grade limestone containing not less than 85 percent total carbonates. Limestone shall be ground to such fineness that 25 percent will pass a 100-mesh sieve and 100 percent will pass an 8-mesh sieve.

#### 2.1.2 Mulch

##### 2.1.2.1 General

If the Contractor elects to use mulch to protect the turfed areas, the material used for mulching shall be materials that do not contain noxious grass or weed seed that might be detrimental to the turfing being established or to adjacent farmland.

### 2.1.2.2 Wood Cellulose Fiber Mulch

Wood cellulose fiber mulch for use with hydraulic application equipment shall consist of wood cellulose fiber, processed to contain no growth or germination inhibiting factors, and dyed an appropriate color to facilitate visual metering of application of the materials. The wood cellulose fiber shall contain not in excess of 10 percent moisture, air dry weight basis. The wood cellulose fiber shall be manufactured so that after addition and agitation in slurry tanks, with water, and any other additives, the fibers in the material will become uniformly suspended to form a homogeneous slurry; and that when hydraulically sprayed on the ground, the material will form a blotter-like ground cover which, after application, will allow the absorption of moisture and allow rainfall or mechanical watering to percolate to the underlying soil. The Contractor shall be prepared to submit, on request, certification from the supplier that laboratory and field testing of the product has been accomplished, and that the product meets the foregoing requirements.

### 2.1.3 Water

If the Contractor elects to use water as an aid to establish turf, the water used shall be free of injurious quantities of oil, acid, alkali, salt, and other substances harmful to growth of grass.

### 2.1.4 Spot Sod

If the Contractor elects to spot sod, the sod used to turf the areas specified shall contain a minimum of 85 percent Bermuda grass. Each piece of sod shall have an area of not less than 16 square inches and shall have not less than 2 inches of earth adhering to the roots. Sod that contains noxious grasses and weeds that might be detrimental to the turfing being established will not be acceptable.

### 2.1.5 Sprigs

If the Contractor elects to sprig, the sprigs used to turf the areas specified shall consist of Bermuda grass. Sprigs that contain noxious grasses and weeds that might be detrimental to the turfing being established will not be acceptable.

### 2.1.6 Soil for Repairs

For fill of areas to be repaired, soil shall be of a quality at least equal to that which exists in areas adjacent to the area to be repaired. Soil used shall be free from roots, stones, and other materials that hinder grading, planting, and maintenance operations and shall be free from objectionable weed seeds and toxic substances.

## 2.2 SAMPLING AND TESTING

### 2.2.1 General

Sampling and testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Sampling and testing shall be performed by a recognized testing agency.

### 2.2.2 Soil Testing

Prior to beginning turfing operations, soil from the areas to be turfed shall be tested to determine soil nutrient and limestone requirements. At least one sample per acre shall be tested. Certified test results, and application rates for nitrogen, phosphorous, potash, and limestone (if required), indicated by the soil tests shall be furnished to the Contracting Officer prior to fertilizing.

### 2.2.3 Material Testing

#### 2.2.3.1 Fertilizer and Limestone (If used)

Duplicate signed copies of invoices from suppliers shall be submitted to the Contracting Officer. Invoices for fertilizer shall show quantities and the percentages of nitrogen, phosphorous, and potash. If limestone is used, the limestone invoice shall show the quantity and the percentages of limestone that pass the 100- and 8-mesh sieves. Upon completion of the project, a final check of the total quantity of fertilizer used will be made against total area treated, and if minimum rates of application have not been met, an additional quantity of material sufficient to make up the minimum application rate shall be distributed as directed.

## PART 3 EXECUTION

### 3.1 COMMENCEMENT, PROSECUTION, AND COMPLETION

#### 3.1.1 General

The dressing and turfing operation for embankments shall commence as soon as practicable following the completion of construction in an area. Dressing and turfing operations on other areas shall commence upon completion of all work in that area. Prior to prosecuting the turfing operation, the Contractor shall repair rainwash, if any, dress, and prepare the areas for turfing. All turfing operations shall be accomplished during the season between 1 March and 30 June, or between 1 September and 15 November, inclusive, unless otherwise authorized by the Contracting Officer.

### 3.1.2 Sequence of Work

The sequence of operations for work prescribed in this section shall be as follows:

- (1) Preparation of ground surface.
- (2) Fertilizing.
- (3) Spot sodding or sprigging.
- (4) Compacting, where applicable.
- (5) Mulching, where applicable

## 3.2 PREPARATION OF GROUND SURFACE

### 3.2.1 General

Equipment, in good condition, shall be provided for the proper preparation of the ground and for handling and placing all materials. Equipment shall be approved by the Contracting Officer before work is stated.

### 3.2.2 Clearing

Prior to grading and finish dressing, vegetation that may interfere with turfing operations shall be removed and shall be disposed of as specified in SECTION 02114 CLEARING, paragraph 3.2. The surface shall be cleared of roots, cable, wire, and other materials that might hinder the work or subsequent maintenance.

### 3.2.3 Dressing

Surfaces to be turfed shall be dressed to the extent necessary to provide drainage and the specified slopes, and as necessary to remove high points and fill depressions sufficiently to provide reasonably smooth surfaces. Necessary repairs to previously graded areas shall be made with suitable material placed and compacted as directed by the Contracting Officer. Suitable material for repairs may be obtained from the required excavation or from an off site borrow area as specified in SECTION 02225 EARTHWORK, paragraph 3.3.2.

## 3.3 SPECIAL EQUIPMENT

Hydraulic equipment used for the application of slurry of prepared wood cellulose fiber mulch shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry. The slurry distribution lines shall be large enough to prevent stoppage. The discharge line shall be equipped with hydraulic spray nozzles that will provide even distribution of the slurry on the various slopes to be mulched. The slurry tank shall have a minimum capacity of

1,000 gallons and shall be mounted on a traveling unit, which may be either self-propelled or drawn by a separate unit, that will place the slurry tank and spray nozzles near the areas to be mulched so as to provide uniform distribution without waste. The Contracting Officer may authorize equipment with a smaller tank capacity provided that the equipment has the necessary agitation system and sufficient pump capacity to spray the slurry in a uniform coat over the surface of the area to be mulched.

### 3.4 APPLICATION OF FERTILIZER AND/OR LIMESTONE (IF USED)

Fertilizer and limestone (if used) shall be distributed uniformly over the areas to be sprigged or spot sodded at the rate determined as specified in 2.2.2 above and shall be incorporated into the soil by light disking, harrowing, or other acceptable methods immediately following the application.

### 3.5 SPOT SODDING

If the Contractor elects to spot sod, the areas to be turfed shall be spot sodded with Bermuda grass in any manner selected by the Contractor to meet the coverage requirements set forth in paragraph 3.9.1 below.

### 3.6 SPRIGGING

If the Contractor elects to sprig, the areas to be turfed shall be sprigged with Bermuda grass in any manner selected by the Contractor to meet the coverage requirements set forth in 3.9.1 below.

### 3.7 APPLYING AND ANCHORING MULCH

Mulch shall be spread uniformly in a continuous blanket, using 2 tons per acre of straw mulch or 1,200 pounds per acre of wood cellulose fiber mulch. Straw mulch shall be spread either by hand or by a manure spreader or by a modified grain combine with straw-spreader attachment or by a blower-type mulch spreader. Mulching shall be started at the windward side of relatively flat areas, or at the upper part of a steep slope, and continued uniformly until the area is covered. The mulch shall not be bunched. Immediately following spreading, straw mulch shall be anchored to the soil by a V-type-wheel land packer, a scalloped-disk or other suitable equipment operated parallel to the embankment centerline. The number of passes needed, not to exceed three, will be determined by the Contracting Officer. Wood cellulose fiber mulch shall be applied with equipment conforming to the requirements of 3.3 above.

### 3.8 HYDRAULIC SLURRY METHOD

The hydraulic slurry method of fertilizing and mulching, or any combination thereof, may be used by the Contractor, except that in no event shall the mulch be applied prior to fertilizing. Equipment to be used for application of materials by the hydraulic slurry method shall conform to the requirements specified in 3.3 above.

### 3.9 ESTABLISHMENT

#### 3.9.1 General

Turfing will be considered to be completed when the areas to be turfed show that growth of the specified grass has reached a point of maturity such that it has produced stems or runners which overlap adjacent similar growth over 85 percent of the entire area as determined by random sampling on a square-yard basis with no bare spot exceeding 36 square inches.

#### 3.9.2 Maintenance

The Contractor shall be responsible for the turfed areas while grass is becoming established to the point of acceptance by the Contracting Officer. During establishment and prior to acceptance of the sodded areas, the Contractor shall repair rainwash damage, if any, to the completed embankment at the contract. Turfed areas shall be kept mowed to a height between 4 and 12 inches above the turfed no additional cost to the Government. The turfed areas shall be maintained by mowing for the life of the Contract. Should the Contractor fail to mow the turfed areas to the limits as specified above, the Government will assume the responsibility for the mowing and deduct the cost thereof from any payments due the Contractor.

### 3.10 INSPECTION AND ACCEPTANCE

#### 3.10.1 General

Acceptance of the turfed areas will be determined by visual inspection. Existence of rainwash damage or dead and dying turf will not be acceptable. Twenty-five percent (25%) of this item cost will be retained pending final acceptance of turfing.

#### 3.10.2 Areas Requiring Returfing

Areas being inspected for completion that do not meet the requirements for completion as specified hereinabove shall be returfed at no additional cost to the Government.

-- End of Section --

DIVISION 3 – CONCRETE

THRU

DIVISION 16 – ELECTRICAL

(NOT USED)