

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT			1. CONTRACT ID CODE	PAGE OF PAGES	
			J	1	8
2. AMENDMENT/MODIFICATION NO. 0002	3. EFFECTIVE DATE 09-Aug-2004	4. REQUISITION/PURCHASE REQ. NO. W38XGR-4090-8361		5. PROJECT NO.(If applicable) W912EQ-04-B-0020	
6. ISSUED BY US ARMY ENGINEER DISTRICT, MEMPHIS 167 N MAIN STREET B202 MEMPHIS TN 38103-1894	CODE W912EQ	7. ADMINISTERED BY (If other than item 6) See Item 6		CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)			X	9A. AMENDMENT OF SOLICITATION NO. W912EQ-04-B-0020	
			X	9B. DATED (SEE ITEM 11) 02-Jul-2004	
				10A. MOD. OF CONTRACT/ORDER NO.	
				10B. DATED (SEE ITEM 13)	
CODE	FACILITY CODE				
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS					
<input checked="" type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer <input type="checkbox"/> is extended, <input checked="" type="checkbox"/> is not extended. Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning <u>1</u> copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.					
12. ACCOUNTING AND APPROPRIATION DATA (If required)					
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.					
A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.					
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).					
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:					
D. OTHER (Specify type of modification and authority)					
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.					
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) This solicitation for the New Madrid Pumping Station, New Madrid, Missouri scheduled to open 19 August 2004 at 2:30 p.m. is amended as follows:					
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.					
15A. NAME AND TITLE OF SIGNER (Type or print)			16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)		
			TEL: _____ EMAIL: _____		
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY _____ (Signature of Contracting Officer)		16C. DATE SIGNED 09-Aug-2004	

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

The following items are applicable to this modification:

SECTION SF30 - BLOCK 14 CONTINUATION PAGE

AMENDMENT #0002

1. **SECTION 00800, SP. 15 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER** – In the title of the weather days table, change the “6” to “5”.
2. **SECTION 00800, SP. 20 TEMPORARY PROJECT FENCING** – Change the edition of EM-385-1-1 from “Sep 96” to “Nov 03”.
3. **SECTION 00800** – Add the following after SP. 30:

“SP. 31 PARTNERING

The Government proposes to form a partnering relationship with the Contractor that will strive to facilitate communication and draw on the strengths of each in an effort to achieve a quality project within budget and on schedule. Participation is voluntary and does not affect contract award. Partnering will not alter or supercede any provision of the contract nor provide either party any additional contractual rights or obligations. Any cost associated with partnering will be agreed to by both parties and will be shared equally and will not change the contract price. “

4. **SECTION 00800** – Add the following after SP.31:

“SP. 32 ORDER OF WORK

The order of work for construction of the new pumping station shall be as follows for the excavation and embankment portion of the site work:

1. The contractor will be required to excavate the diversion channel to the full section and to the lines and grades as shown on the drawings before closure of the existing channel or construction of the cofferdam portions crossing the existing channel will be allowed.
2. The contractor will complete construction of the cofferdam to the lines and grades as shown on the drawings. The semi-compacted fill shall be placed in the dry.
3. The contractor will complete excavation for the pumping station structure. The dewatering system including piezometers shall be installed and fully operational before excavation for the structure will be allowed.
4. The contractor shall fully complete construction of the pumping station. This item of work shall include all adjacent backfills with full enclosure levee section from the Birds Point – New Madrid Set Back Levee to approximately 315-feet south of the centerline of the pumping station. The southern limits shall be set by maintaining a 100-foot berm between the levee closure embankment and the northern top bank of the diversion channel with a minimum end slope of 1V:2H.
5. Upon approval of the pumping station construction, the cofferdam shall be removed both upstream and downstream of the structure. The side slopes of the existing channel shall be sloped to a 1V:3H as shown on the drawings along the locations of the cofferdam enclosures. If the exiting slopes upstream and downstream of the cofferdam enclosure have not been sloped, then the contractor shall complete this item

of work. This work including cofferdam removal shall begin at the downstream end of the existing channel and proceed in an easterly direction or upstream.

6. The diversion channel shall be refilled with semi-compacted material to natural ground. The material shall be placed in the dry and sloped to drain.
7. The final item of work will be completing the closure levee embankment and raising the existing levee embankments to the lines and grades as shown on the drawings. The completion of these items will require an off site borrow area.

The following general guidelines shall also apply to the project:

1. The contractor will be required to utilize all available materials within the right-of-way limits as shown on Drawing G107 before the contractor can utilize borrow material from the off site source shown on Drawings G108 and G109. All backfill, embankment fill or fill material placed on this project shall be either fully compacted or semi-compacted with the exception of temporary storage of material. Temporary storage will be as specified in the specifications. Therefore, no material will be placed uncompacted. All criteria stated in the plans and specifications will apply.

2. Minimum end slopes of 1V:2H shall be maintained on partial cofferdam construction with berm widths as stated in paragraph 3 below. The contractor at his option can construct low water crossings at the existing channel and diversion channel as long as the low water crossing meets the following stipulations and favorable river stages occur:

a. The low water crossing does not extend higher than Elevation 269 above the channel bottom. Elevation 269 correlates to approximate New Madrid gage reading of 13.5 feet. The contractor shall maintain a minimum drainage opening through the low water crossing of 100 square feet. The contractor shall ensure that the low water crossing remains in place during substantial runoff from the floodway.

3. The contractor will be allowed to temporarily stockpile material anywhere within the right-of-way limits provided that the material is placed a minimum of 75-feet from top bank of existing slopes and/or 40-feet from top bank of excavated slopes of 1V:3H such as the diversion channel slopes. A minimum berm width of 10 feet shall also be maintained from the right-of-way limits. Maximum height that the material can be placed will be 15-feet above natural ground. Side slopes of 1V:2H or flatter shall be maintained on excavated material embankments at all times. Measures shall be taken to ensure that the material will remain in place without erosion, including times when higher Mississippi River stages occur. “

5. **SECTION 01025, 1.1 LUMP SUM PAYMENT** – Delete the paragraph in its entirety and replace with the following:

“Payment items for the work of this contract for which contract lump sum payments will be made are listed in the BIDDING SCHEDULE according to CSI Specification Divisions except as described below. All costs for items of work, which are not specifically mentioned to be included in the listed lump sum item, shall be included in the listed lump sum item under the specification division which is most closely associated with the work involved. The lump sum price for 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 including work of Sections 01130 and 01451, meeting safety requirements, tests and reports, and performing all work required for which separate payment is not otherwise provided.”

6. **SECTION 01025, 1.1 (1)a** – Delete the paragraph in its entirety and replace with the following:

“Payment will be made for costs associated with mobilization and demobilization, as defined in Section 00700 CONTRACT CLAUSE 252.236-7004 PAYMENT FOR MOBIZATION AND DEMOBILIZATION and for

providing signs, barricades, and traffic control outlined in Section 01450 PROJECT SIGNS, BARRICADES, AND TRAFFIC CONTROL.”

7. **SECTION 01025, 1.1 (2)a** – Delete the paragraph in its entirety and replace with the following:

“Payment will be made for the costs associated with operations necessary for environmental protection as specified in Section 01130 ENVIRONMENTAL PROTECTION, Section 00800 SP. 14 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) and other environmental protection measures as may be noted elsewhere in the contract documents.”

8. **SECTION 01025, 1.1, (3)a through (16)a** – Delete “...which have not been previously mentioned.” At the end of each paragraph.

9. **SECTION 01130, 1.2.1** – In the first sentence, change “21 days” to “15 days”.

10. **SECTION 01330** – Delete submittal sheets for 01130 and 01451 in their entirety.

11. **SECTION 01330** – For the following Submittal Registers change, “Government Approved” to “Information Only”:

Spec Section 02240, Spec Paragraph Number 1.3,1.3,1.4.1,3.1.and 3.2.3.

Spec Section 02330, Spec Paragraph Number 1.4.1,1.4.3 and 2.2.4.

Spec Section 02411, Spec Paragraph Number 1.2 Pile,1.2 Pulling and 1.2 Interlocked.

Spec Section 02542, Spec Paragraph Number 2.1,2.2 and 2.2.5.

Spec Section 02546, Spec Paragraph Number 1.2.

Spec Section 02548, Spec Paragraph Number 2.1.6 and 2.1.8.

Spec Section 02670, Spec Paragraph Number 1.3.

Spec Section 02707, Spec Paragraph Number 1.2 Materials and 1.2 Pressure.

Spec Section 02714, Spec Paragraph Number 1.2.

Spec Section 03200, Spec Paragraph Number 2.2, 2.3 Details, 2.3 Bars and 2.4.

Spec Section 03301, Spec Paragraph Number 1.4, 2.1.1, 2.1.7, 2.1.9, 2.2, 3.3.4, 3.3.5, and 3.5.

Spec Section 04200, Spec Paragraph Number 1.2 Cold Weather, 2.5 Masonry, 2.5 Mortar, 2.6, 2.7, 2.10, 2.11, 3.19.1, 3.19.2, 3.19.3 and 3.19.4.

Spec Section 05915, Spec Paragraph Number 1.2 Sequence.

Spec Section 07220, Spec Paragraph Number 1.2 Insulation, 1.2 Installation, 2.1, 2.2, 2.5, 2.6 and 3.8.

Spec Section 07510, Spec Paragraph Number 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.10 and 3.18.

Spec Section 08110, Spec Paragraph Number 2.2.

Spec Section 09510, Spec Paragraph Number 1.3.

Spec Section 09900, Spec Paragraph Number 1.2.

Spec Section 09940, Spec Paragraph Number 1.3 Qualifications, 1.3 Accident, 1.3 Confined, 1.3 Respiratory, 1.3 Airborne, 1.3 Ventilation, 1.3 Medical, 1.3 Waste, 1.3 Containment, 1.3 Ambient, 1.3 Visible, 1.3 Special, 1.3 Specification, 1.3 Thinners, and 1.3 Inspections.

Spec Section 11212, Spec Paragraph Number 1.4 System, 1.4 Bearings, 1.4 Gears, 1.4 shafts, 1.4 Couplings, 1.4 Backstop, 1.4 Housing, 1.4 Lubrication, 1.4 Instrumentation, 1.4 Speed, 1.4 Lubricant, 1.4 Reducer, 1.4 Shop, 1.4 Field, 1.4 Operation.

Spec Section 11330, Spec Paragraph Number 1.3 Spare Parts.

Spec Section 14630, Spec Paragraph Number 1.4 Spare Parts.

Spec Section 15250, Spec Paragraph Number 1.4.

Spec Section 15400, Spec Paragraph Number 1.5 Welding, 1.5 Bolts.

Spec Section 15895, Spec Paragraph Number 1.4 Welding, 1.4 Welding Qualifications, 1.4 Test.

Spec Section 16375, Spec Paragraph Number 1.3 Cable, 1.3 Certificates, 1.3 Cable Installer and 3.2.1.5 Cable Installation.

Spec Section 16403, Spec Paragraph Number 2.6.1.3, 3.1.2 and 3.4.3.

Spec Section 16405, Spec Paragraph Number 1.3 Seismic, 1.3 Tests and 3.4.4.

Spec Section 16415, Spec Paragraph 1.3 Factory, 1.3 Field Test Plan, 1.3 Field Test Reports, 1.3 Materials and 3.19.

Spec Section 16475, Spec Paragraph Number 1.2 Preventive, 1.2 Field and 1.2 Devices.

Spec Section 16670, Spec Paragraph Number 1.3 Material.

12. **SECTION 01330, Submittal Sheet for Section 02221** – Delete Spec Paragraph Number 2.1.5, 3.1.4, 3.5.1 and 3.5.2 and all requirements for same.
13. **SECTION 01330, Submittal Sheet for Section 02222** – Delete Spec Paragraph Number 2.2.1 and all requirements for same.
14. **SECTION 01451, 3.2.1** – In the first sentence, change “21 days” to “15 days”.
15. **SECTION 02111, 3.4.1 General** – Delete the paragraph in its entirety and replace with the following:

“The method of disposing of all debris resulting from clearing and grubbing operations shall be by burning as specified in paragraph BURNING or removal from the site in accordance with paragraph REMOVAL FROM SITE OF WORK. The Contractor shall make a reasonable effort to channel merchantable material into the commercial market to make beneficial use of materials resulting from clearing and grubbing operations.”
16. **SECTION 02111, 3.4.2 Burning** – Add the following sentence at the end of the paragraph. “Any material remaining after burning shall be hauled off site.”
17. **SECTION 02111, 3.4.3 Burying** – Delete the paragraph.
18. **SECTION 02221** – Delete the section in its entirety and replace with the attached amended Section 02221.
19. **SECTION 02222** - Delete the section in its entirety and replace with the attached amended Section 02222.
20. **SECTION 02240, 3.2.1 General** - Add to the end of the paragraph. “All test holes by either method shall be grouted upon completion.”
21. **SECTION 02240, 3.2.3 Standard Penetration Tests** - Add after first paragraph. “(See 1997 Annual Book of ASTM Standards for ASTM D 4633).”
22. **SECTION 02240, FIGURE 2** - Replace and add the following to the figure. Replace the horizontal heading or X-axis to Standard Penetration Resistance N60, lb/ft. Figure 2 - Relationship among Relative Density, Overburden Pressure and SPT Bow Count. (After Gibbs and Holtz, 1957) -- Gibbs, H.J. and Holtz, W.G., 1957, “Research on Determining the Density of Sands by Spoon Penetrating Testing” Proc. Fourth International Conference on Soil Mechanics and Foundation Engineering, London, 1957.
23. **SECTION 02330** - Delete the section in its entirety and replace with the attached amended Section 02330.
24. **SECTION 02542, TOC** - Add to PART 3 EXECUTION – 3.4 GROUTING, 3.4.1 Placement, and 3.4.2 Maintenance.
25. **SECTION 02542, 1.2 QUALITY CONTROL** – Add to paragraph – “(5) Grouting qualifications and placement.”
26. **SECTION 02542, 2.2.3** – Delete the paragraph in its entirety and replace with the following:

“Gradation shall conform to Plates I and II 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. An allowance of 5 percent by weight for inclusion of quarry spalls will be permitted. Stone shall be reasonably well graded between the largest and smallest pieces. Plates I and II describe the upper and lower limit curves for the riprap gradation. The graph of

the riprap when plotted on ENG Form 4794-R with the limit curves plotted thereon is inserted at the end of this Section as Plates I and II. The graph of the riprap must lie between these upper and lower limit curves.”

The attached PLATE I, PLATE II, PLATE III and PLATE IV replace the plates at the end of this section.

27. **SECTION 02542, 3.4** – The following specification shall be added to Section 02542, Stone Protection for grouting of the R650 riprap just down stream of the concrete stilling basin for the limits shown on the amended drawings.

SECTION 02542
STONE PROTECTION

3.4 GROUTING

3.4.1 Placement

Portions of completed riprap paving for the downstream stilling basin as indicated on the amended drawings shall be grouted. The grouting of the riprap shall be in the dry. Grout shall be composed of Portland cement, water, clean sand, pea gravel, and an air-entraining admixture. The contractor can submit a different design mix as long as the stipulations of this specification are met. The water-cement ratio shall be limited to a maximum value of 0.45 by weight, and the entrained air content shall be between 5 and 8 percent of the total grout volume. The grout mixture shall have a minimum compressive strength of 4,000 pounds per square inch at 28 days. The grout shall penetrate the R650 riprap a minimum of 24 inches. The use of water reducing and accelerating admixtures will be subject to the approval of the Contracting Officer. The grout shall be mixed in a manner so as to produce a mixture having a consistency that will permit gravity flow into the interstices of the riprap with the help of limited spading and brooming. The grout shall be used in the work within 90 minutes after mixing. Retempering of grout will not be permitted. Riprap shall not be grouted when the ambient temperature is below 40 degrees F or above 85 degrees F unless approved by the Contracting Officer in writing, nor when the grout, without special protection, is likely to be subjected to freezing temperatures before final set has occurred. Prior to grouting, all surfaces of riprap shall be wetted. The riprap shall be grouted in successive strips, approximately 10 feet in width, commencing at the end of the concrete stilling basin and proceed downstream and also placing the grout up the slopes starting on the lowest strip and working up the slope. Each batch of grout shall be dumped on the upper portion of the ungrouted part of the strip and worked into the voids between the stones and down the slopes. Grout shall be brought to the place for final deposit by approved means, and in no case shall grout be permitted to flow on the riprapped surface a distance in excess of 10 feet. Immediately after dumping a batch of grout, it shall be distributed over the surface of the strip by the use of brooms and the grout worked into place between stones with suitable spades and trowels. As a final operation, the excess grout shall be removed from the top surfaces of the upper stones and from pockets and depressions in the surface of the stone protection by use of a stiff broom having bristles resistant to water and capable of withstanding hard sweeping and scrubbing. After completion of any strip as specified, no workman, nor any load, shall be permitted on the grouted surface for a period of at least 24 hours. The surface of all grouted riprap shall be protected from rain, flowing water and mechanical injury for a period of at least 24 hours. The surface of all grouted riprap 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. Testing of grout shall be in accordance with Section 03301, 3.7 TEST AND INSPECTIONS. The contractor shall demonstrate that the minimum 24-inch grout penetration requirement is being met before proceeding with the placement of the grout.

3.4.2 Maintenance

The Contractor shall maintain the grouted riprap until accepted, and any material displaced prior to acceptance and due to the Contractor's negligence shall be replaced at his expense and to the lines and grades shown on the contract drawings.

-- End of Section --

28. **SECTION 02548, 1.3 APPLICABLE PUBLICATIONS** – Add to MoDOT, 1996 Edition, or current edition.
29. **SECTION 02714, 1.3 GENERAL** - Add to the end of the paragraph. “Contractor shall be responsible for obtaining and having on site all licenses and permits required to meet all federal and state requirements regarding wells and other ground penetrations for the dewatering system. Submit a copy of each permit and license to the Contracting Officer of information.”
30. The reinforcement for the baffle blocks has been revised. The baffle blocks in the stilling basin have increased in height from two feet to four feet. The steel reinforcement has been changed as depicted in the attached sketch named NEW MADRID PUMPING STATION BAFFLE BLOCK. The new attached sketch shall become part of the Plans and Specifications.

DRAWINGS

The following Drawings were amended. G107, G108, G109, C101, C103, C104, C105, C203, C204, C205, C206, C208, C301, C303, C304, C403, C404, C406, C601 and C602.

Drawing M301, Pump Schedule Table - Change “2250 HP” to “2000 HP” for main pumps and change “310 RPM” to “271 RPM” for main pumps.

Drawing M301, Miscellaneous Mechanical Equipment Schedule - The sewage treatment plant, Red Fox Environ Model No. 350-C or equal, is deleted in its entirety and the following is substituted in its place: “An underground 1000 gallon tank, 9 ft long , 4 ft wide and 4 ft 6 inches deep concrete holding tank is added. The tank shall be located on the east side of the building outside adjacent to the toilet area. The piping shall be rerouted to the tank from the toilet area. The tank shall have a side inlet and top outlet with cover and rim for sewage pump out.”

INVITATION NO. W912EQ-04-B-0020

DIVISION 2 - SITE WORK

SECTION 02221

EXCAVATION, FILL, BACKFILL AND EMBANKMENT FOR STRUCTURES

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INVITATION NO. W912EQ-04-B-0020

SECTION 02221

EXCAVATION, FILL, BACKFILL AND EMBANKMENT FOR STRUCTURES

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 698	91(1998) Laboratory Compaction Characteristics of Soil Using Standard Effort [12,400 ft-lbf/cu.ft. (600kN-m/cu.m.)]
ASTM D 1556	90(1996)e1 Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2216	(1998) Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996)e1 Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 General

All materials for backfill and fill shall be free of roots, trash and other objectionable matter and shall be obtained from the required excavations, or from the designated borrow area. No frozen material shall be placed and material shall not be placed against frozen surfaces.

2.1.2 Pervious Backfill

Pervious backfill shall be sand composed of tough, durable particles and shall contain no organic matter nor soft, friable particles. The pervious backfill material shall be clean, free draining sand (SP and SW) classified in accordance with ASTM D 2487 except that no more than 5 percent by weight shall pass a No. 200 sieve.

2.1.3 Embankment Backfill and Semicompacted Fill

Except as specified below, embankment backfill including both compacted and semicompacted fill material shall consist of any or all types of materials (except organic materials) from required excavation or from borrow. Material classified in accordance with ASTM D 2487 (as shown on the Soil Boring Legend) as gravels (GW, GP, GM) and sands (SW, SP, SM) shall not be used as materials unless suitably blended with less pervious material. The addition of less pervious material and the blending shall be accomplished to such a degree that the material is changed to a classification other than gravels (GW, GP, GM) and sands (SW, SP, SM) such as clayey gravel (GC) or clayey sand (SC).

2.1.4 Impervious Backfill

Impervious material shall be classified as a cohesive clay material classified as either (CL) or (CH) by the Unified Soil Classification System.

2.1.5 Frozen Materials

Under no circumstances shall frozen earth, snow, or ice be placed in fill or backfill. The Contracting Officer may require the wasting of frozen material in order that construction may proceed and such material wasted by written order of the Contracting Officer will be paid for in accordance with the Contract Clause "CHANGES". The Contractor may waste frozen material, at his own expense, in order to proceed with the work even when the Contracting Officer has not issued a written order.

2.1.6 Unsuitable Materials

Materials which are classified as unsuitable for fill or backfill material are defined as masses of organic matter, sticks, branches, roots and other debris. As earth may contain excessive amounts of wood, isolated pieces of wood will not be considered objectionable in the embankment provided their length does not exceed 12 inches, their cross-sectional area is less than 4 square inches, and they are distributed throughout the fill. Not more than one percent (by volume) of objectionable material shall be contained in the earth material placed in each cubic yard of backfill. Pockets or zones of wood shall not be placed in the fill or backfill.

2.2 EQUIPMENT

Compaction equipment shall be in accordance with Section 02330 EMBANKMENT FOR LEVEES, paragraph EQUIPMENT.

PART 3 EXECUTION

3.1 EXCAVATION

3.1.1 General

Excavation shall consist of removal and disposal of all materials of whatever nature encountered that may be necessary to excavate for structural foundations, pipe, trench and channels. Excavation may be performed by any reasonable methods which will produce the desired results. Excavation shall be performed to the lines, grades and sections indicated on the drawings or as otherwise required.

3.1.2 Excavation for Structure and Channels

The foundations for the structures shall be excavated to the lines and grades necessary for placement of formwork and concrete and that will insure stable slope conditions throughout the construction. The channels shall be excavated to the lines, grades and sections indicated on the drawings, within allowable tolerance of plus or minus 3 inches, as long as neither exist for more than 10 percent of the area. All foundations shall be on solid, undisturbed or properly compacted material. The bottom and side slopes of excavation upon or against which concrete or filters are to be placed shall be accurately finished to the dimensions prescribed and or directed, within allowable tolerance of +1/2 inches and -2 inches and plus or minus 2 inches for stone as long as neither exist for more than 10 percent of the area or 200 square feet. Where disturbed by the Contractor's operations and elsewhere as required, the excavated surfaces shall be moistened with water or dried as necessary and tamped or rolled with suitable tools or equipment for the purpose of thoroughly compacting them and forming firm foundations upon or against which to place the concrete or stone. Except for the permissible tolerance, over excavation will not be permitted except to remove unsuitable material as directed by the Contracting Officer, and the Contractor will not be paid for over excavating. Unauthorized over excavation shall be backfilled with approved materials, placed in layers not more than 4 inches in thickness, and thoroughly compacted by tamping or rolling to a density at least equal to that of the adjacent similar undisturbed material. This corrective work shall be at no additional cost to the Government.

3.1.3 Removal of Unsuitable Materials

If, at any point in the excavation for the structure, the foundation material below the lines indicated on the drawings is found to be unsuitable, it shall be removed to the depth directed by the Contracting Officer and replaced with approved material placed and compacted as specified above for backfill of over excavation. Payment for authorized over excavation and backfill of authorized over excavation will be made in accordance with the Contract Clause "CHANGES".

3.1.4 Disposal of Excavated Materials

Suitable materials removed from required excavation may be disposed of by placing directly into embankment fill, backfill, or by stockpiling for later use in embankment fill or backfill. Materials from structure excavation that are not suitable for use as embankment fill or backfill, shall be disposed of in accordance with Section 02222 EXCAVATION FOR LEVEES, paragraph UNSUITABLE MATERIALS.

Stockpiles of materials temporarily stored for later use shall be located in areas approved by the Contracting Officer and can be located anywhere within the right-of-way limits as stated in Amendment 2. Stockpiles shall be built up in layers not more than 2 feet in thickness. Stockpiled material shall have a maximum height not to exceed 15 feet, shall have end and/or side slopes not steeper than 1V on 2H, and the surfaces of all stockpiles shall be sloped to drain readily and sealed by compacting. Excavation from stockpiles shall be made so as to maintain drainage at all times. No stockpiled material shall be placed within 75-feet of top bank of existing slopes or 40-feet from top bank of excavated slopes of 1V:3H. A minimum berm width of 10-feet shall also be maintained from the right-of-way limits. Measures shall be taken to ensure that the material will remain in place without erosion, including times when higher Mississippi River stages occur.

3.1.4.1 Disposal of Discarded Materials

Discarded material other than those which can be included in the solid waste category shall be disposed

of as specified in paragraph EXCAVATION, subparagraph DISPOSAL OF EXCAVATED MATERIALS.

3.2 PLACEMENT

3.2.1 Backfill and Embankment

3.2.1.1 General

All fills and backfills associated with the concrete structure and road subgrade shall be placed as shown on the drawings. All material will either be compacted or semi-compacted except for temporary storage of excavated materials. All fills and backfills shall be placed in the dry. Fills and backfills associated with the ditches shall be placed as semicompacted fill. No backfill or fill shall be placed on any part of the foundation until such areas have been inspected and approved. Backfill or fill shall not be placed on or against concrete surfaces prior to 14 days after the placing of the concrete, except when otherwise approved or required by the Contracting Officer. No backfill or fill shall be placed on frozen surfaces and no frozen materials shall be placed in the backfill or fill. The foundation surface and any concrete surfaces shall be suitably moistened prior to placement of backfill against them. Unless otherwise directed, the backfill or fill shall be brought up and maintained at approximately the same level regardless of the number of types of material being placed. Materials shall be so placed that there is no mixing of the different types of materials in the backfill or fill.

3.2.1.2 Spreading

After dumping, the materials shall be spread by bulldozer or other approved means in approximately horizontal layers over the entire area under construction. During the dumping and spreading process, the Contractor shall remove all roots, trash and debris from the backfill materials. Semicompacted materials shall be placed in layers, the first layer not more than 6 inches in thickness and the succeeding layers not more than 1 foot thick prior to compaction with tamping rollers. Thickness of layers of compacted structure backfill, embankment and impervious backfill shall be placed in layers not more than 8 inches in thickness prior to compaction, with the first layer 6-inches. Thickness of layers of pervious material shall not be greater than 9 inches, with the first layer 6-inches. As soon as practicable after commencement of construction of any section of the backfill or fill, the surface shall be sloped to drain freely and shall be so maintained throughout construction. If the compacted surface of any layer is determined to be too smooth to bond properly with the succeeding layers, it shall be loosened by harrowing or by other approved means before the succeeding layer is placed thereon. Ruts in the surface of any layer shall be filled before compacting additional materials.

3.3 COMPACTION

3.3.1 Semicompacted Embankment and Backfill

Semicompacted fill and embankment backfill shall be compacted in accordance with Section 02330 EMBANKMENT FOR LEVEES, paragraph SEMICOMPACTED EMBANKMENT.

3.3.2 Fully Compacted Embankment and Backfill

3.3.2.1 Impervious Backfill and Embankment

After a layer of impervious backfill and embankment fill has been placed and spread, it shall be harrowed or disked, if required, to break up and blend the backfill materials, unless harrowing or

disking is performed to obtain uniform moisture distribution. Harrowing or disking shall be performed with a spring-tooth harrow or other approved harrow or disk to the depth of the uncompacted layer. If one pass of the harrow or disk does not accomplish the breaking up and blending of the materials, additional passes of the harrow or disk may be required, but in no case will more than three passes of the harrow or disk on any one layer be required for this purpose. When the moisture content and the condition of the layer is satisfactory, the lift shall be compacted to at least 95 percent of the maximum density as determined by ASTM D 698. Each type material used in the backfills or changes in material types shall have individual density curves by ASTM D 698. Portions of the backfill or fill which are not accessible to the roller and portions within 2 feet shall be placed in 4 inch layers and compacted with power tampers to a degree equal to that obtained on the other portions of the compacted backfill or fill by rolling as specified. Dumping, spreading, sprinkling, and compacting may be performed at the same time at different points along a section when there is sufficient area to permit these operations to proceed simultaneously.

3.3.2.2 Pervious Backfill

Immediately after each layer of pervious backfill or fill material has been placed, spread and saturated, the entire surface of the layer shall be compacted to at least 95 percent of the maximum density as determined by ASTM D 698. Pervious backfill placed within 2 feet of concrete shall be placed in layers not more than 4 inches thick, shall be saturated by flooding and shall be compacted by use of approved small vibratory compactors to 95 percent of the maximum density as determined by ASTM D 698.

3.3.3 Filter Materials

Filter materials, sand and gravel, shall be compacted as specified in paragraph 3.3.2.2 Pervious Backfill above.

3.4 MOISTURE CONTROL

3.4.1 General

The materials in each layer of the backfill or fill shall contain the quantity of moisture within the limits specified below or as directed by the Contracting Officer which is necessary to obtain the desired compaction as determined by the Contracting Officer.

3.4.2 Impervious Backfill

The impervious moisture content shall be as uniform as practicable throughout any one layer of backfill and clay blanket. The upper and lower limits of moisture content shall not be more than 3 nor less than 2 percentage points, respectively, from the optimum moisture content as determined by the Contracting Officer in accordance with ASTM D 698. The method of determining the moisture content shall be according to ASTM D 2216. Material that is too wet shall be spread on the backfill and permitted to dry, assisted by disking or harrowing, if necessary, until the moisture content is reduced to a value within the specified limits. When the material is too dry, the Contractor will be required to sprinkle each layer on the backfill. Harrowing or other approved methods will be required to work the moisture into the material until a uniform distribution of moisture is obtained. Water applied on a layer of backfill shall be accurately controlled in quantity so that free water will not appear on the surface during or subsequent to rolling. Should too much water be added to any part of

the backfill so that the material is too wet to obtain the desired compaction, the rolling and all work on that section of the backfill shall be delayed until the moisture content of the material is reduced to a value within the specified limits and such delay shall not be the basis for a claim. If it is impracticable to obtain the specified moisture content by wetting or drying the material on the backfill, the Contractor may be required to prewet or dry back the material at the source. If, in the opinion of the Contracting Officer, the top or contact surfaces of a partial backfill section becomes too dry or too wet to permit suitable bond between these surfaces and the additional backfill to be placed thereon, the Contractor shall loosen the dried or wet materials by scarifying or disking to such depths as may be directed by the Contracting Officer, shall dampen or dry the loosened material to an acceptable moisture content and shall compact this layer as provided in paragraph COMPACTION, to densities comparable to the underlying backfill or fill, at no additional cost to the Government.

3.4.3 Pervious Backfill

Pervious backfill shall be wetted by sprinkling after spreading for compaction and each layer shall be kept in a saturated condition during rolling. Sprinkling shall be done by approved methods. All connections in the water supply system shall be watertight. Jets shall not be directed at the backfill with such force that finer materials will be washed out. Pervious backfill materials shall be kept free of muddy water and surface runoff and any pervious backfill material which becomes contaminated shall be removed and replaced at no expense to the Government.

3.5 SLIDES

3.5.1 Embankment Slides

In the event of the sliding of any part of the embankment during construction or after completion, but prior to acceptance, the Contractor shall, upon written order of the Contracting Officer, cut out and remove the slide and then rebuild that portion of the embankment or as an alternative shall construct a stability berm of such dimensions and placed in such a manner as the Contracting Officer shall prescribe. In case the slide is caused through fault or negligence of the Contractor, the foregoing operations shall be performed without cost to the Government. In case the slide in the embankment is not caused through fault or negligence of the Contractor, the volume ordered removed from the embankment and volume replaced in the embankment will be paid for in accordance with the Contract Clause "CHANGES", in addition to any payment due the Contractor for materials previously placed. In either case, the method of slide correction will be determined by the Contracting Officer

3.5.2 Channel Slides

In case sliding occurs in any part of the prescribed excavation for the inlet or outlet channel during construction or after completion but prior to acceptance, the Contractor shall remove and repair such portions of the slides as the Contracting Officer may direct. In case the slide is caused through fault of the Contractor, the slide shall be removed and repaired without cost to the Government. In case the slide is not caused through fault of the Contractor, an equitable adjustment pursuant to the Contract Clause "CHANGES" will be made for removing and repairing the slide.

3.6 GRADE TOLERANCES

3.6.1 General

Embankments and fills shall be constructed to the lines and grades and sections indicated on the contract drawings. The following tolerances will be permitted above and below the design grades and cross sections provided that the areas drain and there are no abrupt bulges or depressions in surfaces and side slopes are uniform.

3.6.2 Embankments, Slopes and Structures

For the side slopes of the road embankment and fill areas adjacent to permanent structures, a vertical tolerance of plus or minus 2 inches will be permitted, except that neither extreme of such tolerance may be continuous over an area greater than 200 square feet and abrupt changes from one extreme to the other will not be permitted. The horizontal tolerance will be plus or minus 6 inches.

3.6.3 Channels

For the bottom elevation and side slopes of the channels, a vertical tolerance of plus or minus 6 inches from the grade indicated on the contract drawings will be permitted and shall present a neat, smooth surface, and shall be free from all obstructions. Neither extreme of such tolerance may be continuous over an area greater than 600 square feet and abrupt changes from one extreme to the other will not be permitted.

3.7 FIELD TESTING CONTROL

Testing shall be the responsibility of the Contractor and shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Field density and moisture content tests shall be performed on every 200 cubic yards of material placed. Field in-place density shall be determined in accordance with ASTM D 2922. The calibration checks of both the density and moisture gages shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer using ASTM D 1556 or ASTM D 2167. The Contractor shall submit three copies daily of control tests and reports as well as records of corrective action taken.

End of Section

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DIVISION 2 - SITE WORK

SECTION 02222

EXCAVATION FOR LEVEES

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SECTION 02222

EXCAVATION FOR LEVEES

PART 1 GENERAL

1.1 DESCRIPTION

The work covered by this section consists of furnishing all plant, labor, materials, and equipment, and performing all operations necessary for stockpiling materials, removal of unsuitable material from embankment foundations and all other excavation incidental to the construction of embankments and berms, as specified herein or as shown on the drawings.

1.2 REFERENCES (Not Applicable)

1.3 QUALITY CONTROL

The Contractor shall establish and maintain quality control of excavation operations to assure compliance with contract requirements, and maintain detailed records for all construction operations.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 EXCAVATION IN BORROW AREAS

3.1.1 General

The rights-of-way and earth materials for constructing the work will be furnished without cost to the Contractor, at locations specified herein and shown in the drawings.

3.1.1.1 Equipment

The Contractor shall provide the types of equipment as necessary to perform the required excavation according to the *in situ* conditions of the borrow area.

3.1.2 Borrow Areas

3.1.2.1 General

Borrow material is the suitable excavated material within the right-of-way of the New Madrid Pumping Station and the excavated embankment material from the St. John's Channel Enlargement, Item 3 project. Refer to Drawings G108 and G109 for locations of available borrow from the St. John's Channel Enlargement, Item 3. The contractor will be required to utilize all available materials within the right-of-way limits as shown on Drawing G107 before the St. Johns borrow material becomes available.

3.1.2.2 Requirements

Borrow areas shall conform to requirements prescribed herein. The permissible excavation depths in the borrow areas will be specified by the Contracting Officer and as shown on the drawings from the St. John's Channel Enlargement project. But the right is reserved in accordance with the Contract Clause "CHANGES" to modify the permissible depths in accordance with subsurface conditions determined as work proceeds. The bottom of the areas excavated under this contract shall be dressed to the extent necessary to provide a reasonably smooth surface that can readily be traversed by a 50 to 60 horsepower farm tractor pulling a rotary-type pasture mower and sloped to provide surface drainage to the low side of the borrow area as soon as all usable materials have been removed or the Contractor has completed his use of the borrow area. Abrupt changes in grade shall be avoided. Unsuitable material wasted in the (borrow areas) shall be sloped to drain. Any excavation below the depths and slopes specified herein, or by the Contracting Office shall be backfilled by the Contractor, at his expense, to the specified permissible excavation line, with suitable material placed and compacted in accordance with Section 02330 EMBANKMENT FOR LEVEES, paragraph SEMICOMPACTED FILL. The borrow areas excavated under this contract shall be drained of water regardless of its source, including subsurface water, and kept free of water during excavation, as excavation will not be permitted in water nor shall excavated material be scraped, dragged or otherwise moved through water. Drainage of borrow areas shall be accomplished by ditching, sump pumping or other approved methods. The borrow areas excavated under this contract and inundated from high river stages shall be drained and allowed to dry to a workable condition as quickly as practicable after the high river stage has passed, Special Contract Requirements "RIGHTS-OF-WAY." To conserve arable land and make optimum use of available borrow, the excavation of the borrow areas shall be made continuous throughout the length of the borrow areas to the permissible borrow depths, to provide the required quantity of suitable material, and in such manner that all suitable available material within the borrow area will be utilized. The Contractor shall submit an excavation plan for approval by the Contracting Officer and shall not begin excavation until the Contracting Officer's approval has been received. The plan shall contain, as a minimum, the following:

- a. The Contractor's proposals for implementing Section 01130 ENVIRONMENTAL PROTECTION insofar as that section applies to borrow areas.
- b. The Contractor's proposed methods and required rights-of-way for draining and keeping the borrow areas free of water during excavation under this contract.
- c. The Contractor's proposed methods for draining borrow areas excavated under this contract which may be inundated by high river stages.
- d. The Contractor's proposals for conserving arable land and for making optimum use of available borrow, including the Contractor's proposed methods for smoothing the bottom of the borrow areas after having completed use of the borrow areas.

3.1.3 Disposal of Materials

3.1.3.1 Suitable Materials

Excavated materials which are suitable for incorporation in the levee embankment, diversion channel refill and berms, or other fills or backfill, shall either be placed directly therein, or stockpiled and subsequently used in the levee embankment and berms or other fills or backfill.

3.1.3.2 Unsuitable Materials

Materials from required excavation which, as defined in Section 02330 EMBANKMENT FOR LEVEES, paragraph UNSUITABLE MATERIALS, are unsuitable for levee embankment and berms or fill or backfill material will be ordered wasted and shall be disposed of as stated in Section 02111, 3.4 Disposal of Debris. Where possible, unsuitable materials in off-site borrow areas shall not be moved.

3.2 EXCAVATION IN OTHER AREAS

3.2.1 General

Excavation from other areas shall consist of removal of material in preparing the levee embankment foundations to the lines and grades shown on the drawings, removal of materials from ditches and channels, removal of material from structural excavation areas as specified in Section 02221 EXCAVATION, FILL, BACKFILL AND EMBANKMENT FOR STRUCTURES, and removal of unsuitable materials as defined in Section 02330 EMBANKMENT FOR LEVEES, paragraph UNSUITABLE MATERIALS. Whenever unsuitable foundation material is encountered, the unsuitable material shall be removed to the depth directed by the Contracting Officer. Care shall be exercised by the Contractor in excavating to the lines and grades shown and in removing unsuitable materials so as not to excavate below the grades specified or depth directed. Excavation below the lines and grades specified or the depth directed shall be backfilled by the Contractor at his expense. Such backfill shall be brought to grade with suitable material with each layer placed and compacted as specified in Section 02330 EMBANKMENT FOR LEVEES, paragraph SEMICOMPACTED FILL. Excavated materials shall be disposed of as specified in paragraph DISPOSAL OF MATERIALS.

3.2.2 Muck

Muck is fine-grained material that settles to the bottom of the stream. There are approximately 5 feet of this material on the bottom that has built up over the past several years. The actual depth is difficult to determine because density is graduated and varies with the depth. The Contractor is not required to move muck material unless it is in the work area. In areas where embankment is to be placed, the material shall be removed as part of surface preparation.

3.2.3 Channels

3.2.3.1 Excavation

Channels shall be excavated to the cross sections, lines, and grades shown on the drawings. Suitable material excavated from these channel shall be used in the embankment(s) or wherever suitable. Any excess material or material unsuitable for use in the embankment as determined by the Contracting Officer shall be wasted and shall be disposed of as specified in paragraph 3.1.3.2 Unsuitable Materials at no additional cost to the Government. Materials that are too wet for semi-compaction or compaction and will require processing before use can be temporarily stored in the storage and disposal area as shown on Drawing G107.

3.2.3.2 Acceptance

Prior to the acceptance of the work, the Contracting Officer may require the excavation of sediments from channels and ditches as necessary to restore them to grade and section. Disposal of such material shall be as directed, and an equitable adjustment under the Contract Clause "CHANGES" will be made.

End of Section

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DIVISION 2 - SITE WORK

SECTION 02330

EMBANKMENT FOR LEVEES

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SECTION 02330

EMBANKMENT FOR LEVEES

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO T 180	(1993) Standard Method of Test for Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-In. (457 mm) Drop
AASHTO T 2	(1991) Standard Methods of Sampling of Aggregates
AASHTO T 87	(1986; Rev 1993) Standard Method for the Dry Preparation of Disturbed Soil And Soil Aggregate Samples for Test

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 136	(1996)a Standard Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D 1556	90(1996)e1 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 2922	(1996)e1 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 422	63(1998) Standard Test Method for Particle-Size Analysis of Soils
ASTM D 4318	(1998) Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 698	(1998) Laboratory Compaction Characteristics of Soil Using Standard Effort [12,400-ft-lbf/cu.ft. (600 kn-m/cu.m.)]
ASTM D 2216	(1998) Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1926 (1996) Safety and Health Regulations for Construction

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01330, "SUBMITTAL PROCEDURES," in sufficient detail to show full compliance with the specification:

SD-07 Schedules; F10.

Construction Equipment List shall be submitted for all Major Equipment to be used. (Example: Compaction Equipment).

SD-09 Reports; F10.

Test Reports shall be submitted by the Contractor for Soil Test within three working days of test date. Soil test shall comply with paragraph entitled, "Quality Control Testing During Construction."

SD-13 Certificates; F10.

Certificates of Compliance for Proposed Soil Materials shall be submitted in accordance with paragraph entitled, "Tests for Proposed Soil Materials."

SD-18 Records; F10.

Records of Existing Conditions shall be submitted by the Contractor prior to the start of work. The Contractor shall verify the existing conditions are correct as shown on the plans and described in the specifications. The Contracting Officer shall be notified immediately if any discrepancies are found.

The records shall include the following:

- Location of Utilities
- Location of Tests
- Location of Inspections
- Location of Approved Utilities

1.3 DEFINITIONS

1.3.1 Soil Materials

Cohesionless soil materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Moisture-density relations of compacted cohesionless soils when plotted on graphs will show straight lines or reverse-shaped moisture-density curves.

Cohesive soil materials include clayey and silty gravels, sand-clay mixtures, gravel-silt mixtures, clayey and silty sands, sand-silt mixtures, clays, and silts. Moisture density relations of compacted cohesive soils when plotted on graphs, will show normal moisture-density curves.

1.3.2 Subgrade

Subgrade shall mean the top surface of a backfill or fill or the uppermost surface of an excavation, graded to conform to the required subgrade elevation and compacted to densities indicated.

1.3.3 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure in AASHTO T 180, Method B or D.

1.4 SAMPLING AND TESTING

1.4.1 Soil Testing and Inspection Service

Borrow materials shall be furnished by the government as shown on Drawings G108 and G109. Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Testing shall include field-testing facilities for quality control during construction period.

1.4.2 Quality Control Testing During Construction

Soil materials shall be tested during construction as follows:

MATERIAL	REQUIREMENT	TEST METHOD	MATERIAL TESTED AND NUMBER OF TESTS
Soil material-in-place after compaction	Density of soil-in-place	ASTM D 1556 Sand Cone Method or ASTM D 2922 Nuclear Method	At least three daily for each subgrade soil material, and for each layer of soil material; additional test whenever there is any change in moisture.

Field in-place density shall be determined in accordance with ASTM D 2922. The calibration checks of both the density and moisture gages shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the Contacting Officer using ASTM D 1556. At a minimum, field density and moisture content tests shall be performed on every 500 cubic yards of material placed

1.4.3 Evaluation of Test Results

Results of density of soil-in-place tests shall be considered satisfactory if the average of any group of four consecutive density tests which may be selected is in each instance equal to or greater than the specified density, and if no density test has a value more than 2 percentage points below the specified density.

PART 2 PRODUCTS

2.1 EMBANKMENTS

2.1.1 General

The embankment for levees and cofferdam shall be constructed of earth obtained from the borrow areas and other required excavations as prescribed in Section 02222 EXCAVATION FOR LEVEES and to the extent shown on the drawings. The embankment shall be constructed of earth that is free from unsuitable and frozen materials as defined in paragraphs UNSUITABLE MATERIALS and FROZEN MATERIALS. Material classified by the Unified Soil Classification System (as shown on the Soil Boring Legend) as gravels (GW, GP, GM) and sands (SW, SP, SM) shall not be used unless suitably blended with less pervious material to the extent that it no longer classifies as these materials.

2.1.2 Unsuitable Materials

Materials which are classified as unsuitable for levee embankment or fill or backfill material are defined as masses of organic matter, sticks, branches, roots, and other debris.

2.1.3 Frozen Materials

Under no circumstances shall frozen earth, snow, or ice be placed in levee embankment or berm. The Contracting Officer may require the wasting of frozen material in order that construction may proceed.

2.2 EQUIPMENT

The following are equipment requirements for embankment construction.

2.2.1 Tamping Rollers

2.2.1.1 Tractor-Drawn

Tractor-drawn tamping rollers shall consist of one or more units. Each unit shall consist of a cylindrical drum not less than 60 inches in length and not less than 60 inches in diameter. Each drum shall have staggered feet uniformly spaced over the cylindrical surfaces so as to provide approximately 3 tamping feet for each 2 square feet of drum surface. The tamping feet shall be 7 to 11 inches in clear projection from the cylindrical surface of the roller, and shall have a face area of not less than 5 nor more than 1.0 square inches. The drums shall be water or sand and water ballasted. The weight of the roller when fully loaded shall not be less than 3,500 pounds per foot of drum length. The Contractor shall vary the amount of ballast in the drums to obtain optimum compaction effort for the material being compacted. The roller shall be equipped with cleaning devices, so designed and attached as to prevent the accumulation of material between the tamping feet. These cleaning devices shall be maintained at their full length and correct alignment throughout the periods of use of the roller. The rolling units of multiple-type tamping rollers shall be pivoted on the main frame in a manner which will permit the units to adapt themselves to uneven ground surfaces and to rotate independently. The roller shall be pulled by a tractor at a speed not to exceed 3.5 miles per hour.

2.2.1.2 Self-Propelled

At the option of the Contractor, self-propelled tamping rollers may be used in lieu of tractor-drawn tamping rollers provided these rollers conform to the towed roller requirements for the length and spacing of tamping feet, the empty weight per foot of drum, and cleaning devices. However, self-propelled rollers exceeding the empty weight requirement may be used, provided that by substitution of tamping feet having a face area not exceeding 14 square inches, the nominal foot pressure on the tamping feet of the self-propelled roller can be adjusted to approximate the foot pressure of the towed

roller for the particular working conditions. Self-propelled rollers conforming to the above requirements but with tamping feet exceeding the 14 square inch maximum face area may be approved for use provided the Contractor demonstrates to the satisfaction of the Contracting Officer by field tests performed in accordance with the provisions of paragraphs ALTERNATIVE COMPACTION EQUIPMENT that the roller can properly compact the fill without creating planes of weakness or laminations. For the self-propelled rollers in which steering is accomplished through the use of rubber-tired wheels, the tire pressure shall not exceed 40 psi. The roller shall be operated at a speed of not more than 3.5 miles per hour.

2.2.2 Rubber-Tired Rollers

Rubber tired rollers shall have a minimum of four wheels per axle equipped with pneumatic tires. The tires shall be of such size and ply as to be capable of being operated at tire pressures between 80 and 100 psi at 25,000 pound wheel load. The roller wheels shall be such that the distance between the nearest edges of adjacent tires is not greater than 50 percent of the rated tire width of a single tire. The roller shall have a rigid steel frame provided with body suitable for ballast loading so that the load per wheel may be varied, as directed by the Contracting Officer, from 18,000 to 25,000 pounds. The roller shall be towed at speeds not to exceed 5 miles per hour.

2.2.3 Crawler-Type Tractors

Crawler-type tractors used for spreading or compaction shall weigh not less than 20,000 pounds, shall exert a unit tread pressure of not less than 6 psi, and shall be operated at speeds not to exceed 3.5 miles per hour when being used for compaction. The tractor will not be considered to be compacting while spreading material.

2.2.4 Alternative Compaction Equipment

The Contractor may propose use of alternative types of compaction equipment not included in these specifications. The suitability of the alternative equipment must be demonstrated to the Contracting Officer by a field test conducted by and at the expense of the Contractor. The alternative compaction equipment must be capable of properly compacting the soil so that no planes of weakness or laminations are formed in the fill. The field test shall consist of compacting a minimum of three layers of an area of embankment with the alternative type equipment. Testing and inspection of the area shall then be performed by the Contractor at no additional cost to the Government. Procedures for constructing and testing the area will be provided by the Contracting Officer. Each proposed alternative type of equipment must be capable of compacting a layer of soil not less than 12 inches thick. A minimum of four complete passes over each layer of the test fill will be required for each type of alternative equipment that is allowed for use, unless in the course of constructing the test fill the Contractor is able to demonstrate that proper compaction can be obtained with fewer passes. Alternative type equipment shall be operated at speeds not to exceed 3.5 miles per hour. If sufficient previous testing has been performed on the alternative compaction equipment proposed by the Contractor to verify the suitability of the equipment to the Contracting Officer's satisfaction, the Contracting Officer may determine that the above-specified field test is not required.

2.2.5 Miscellaneous Equipment

Scarifiers, disks, spring-tooth or spike-tooth harrows, spreaders, power tampers, and other equipment shall be types suitable for construction of levee embankment and berms.

2.2.6 Sprinkling Equipment

Sprinkling equipment shall be designed to apply water uniformly and in controlled quantities to variable widths of surface.

PART 3 EXECUTION

3.1 FOUNDATION PREPARATION

3.1.1 General

After clearing and grubbing, the entire earth surface on or against which semicompacted or compacted fill is to be placed shall be thoroughly broken to a depth of 6 inches. If for any cause, this broken surface becomes compacted in such a manner that, in the opinion of the Contracting Officer, a plane of seepage or weakness might be induced, it shall again be adequately scarified before depositing material thereon. All scarifying and breaking of ground surface shall be done parallel to the centerline of the levee. All of the foregoing work shall be completed at least 200 ft in advance of the levee embankment construction.

3.1.2 Drainage

The foundation receiving fill, and all partially completed fill shall be kept thoroughly drained. All embankment backfill and fill shall be placed in the dry.

3.1.3 Frozen Ground

No fill shall be placed upon frozen ground.

3.2 EMBANKMENT BACKFILL, FILL AND BERM CONSTRUCTION

3.2.1 Semicompacted Fill

3.2.1.1 General

The location and extent of the semicompacted fill shall be as shown on the drawings. Semicompacted fill shall also be utilized in the refilling of the diversion channel. Semicompacted fill shall not be placed in water including the construction of the cofferdam and refilling of the diversion channel. The materials for semicompacted fill shall be placed or spread in layers, the first layer not more than 6 inches in thickness and the succeeding layers not more than 12 inches in thickness prior to compaction. Layers shall be started full out to the slope stakes and shall be carried substantially horizontal and parallel to the levee centerline with sufficient crown or slope to provide satisfactory drainage during construction. Benching into the slope of the existing embankment is required in order to place and compact the material in horizontal layers. The vertical face of the existing embankment resulting from the benching operation shall be a minimum of 1 foot in height but shall not exceed 2 feet in height. When the surface of any compacted layer is too smooth to bond properly with the succeeding layer, it shall be adequately scarified before the next layer is placed thereon.

3.2.1.2 Moisture Control

It is intended that the excavated and/or borrow material shall be placed in the embankment at its natural moisture content. However, the Contractor will be required to manage the earthen material

after excavation whether the material is placed in temporary storage and/or by his placement technique that will ensure that the moisture content of the material will stay or change to tolerable limits to facilitate semicompaction. No moisture control will be required by the Contractor, unless, in the opinion of the Contracting Officer, the desired compaction is not being obtained with the prescribed compactive effort due to the material being too wet or too dry. In such cases, the Contractor will be directed to perform moisture control as prescribed below. If the material is too wet, it shall be stockpiled and allowed to drain before it is placed in the embankments or fills and/or the wet material shall be processed by disking and harrowing, if necessary, until the moisture content is reduced sufficiently. If the material is too dry, sufficient moisture shall be uniformly distributed in each layer before compaction. If the Contractor is directed to perform any moisture control as outlined in this paragraph, an equitable adjustment in the contract price and time will be made.

3.2.1.3 Compaction

When the moisture content and conditions of the spread layers are satisfactory, each layer shall be compacted by any of the following methods at the option of the Contractor:

a. Tamper-Type Roller

Four complete passes over each layer will be required. If tamping rollers are used in tandem, not more than two rows will be permitted, and in such case, one trip of the tandem rollers over any surface will be considered as two passes. When tamping rollers are used in tandem, the tamper foot spacing shall be offset so that the circumferential rows on the rear drums are in line with the midpoint of the circumferential rows of the forward drums. Each pass of the tamping roller shall overlap the preceding or adjacent pass by not less than 1 foot.

b. Rubber-Tired Roller

Two complete passes over each layer will be required.

c. Crawler-Type Tractor

Three complete passes over each layer will be required. The tractor will not be considered to be compacting while spreading materials.

3.2.1.4 Definition of Pass

A pass shall consist of one complete coverage of the surface of a layer by the treads of the roller, tractor, or other compacting equipment. Spreading of the material for compaction will not be considered a pass.

3.2.2 Compacted Embankment Fill

The compacted embankment fill including the compacted subgrade for asphalt concrete shall be located as shown on the drawings. Compacted fill shall be placed and spread in uniform layers not more than 8 inches in loose thickness for the full width of the cross section, with the first layer being 6 inches. Layers shall be kept level by use of road graders, bulldozers, or by other approved methods. The entire surface of the embankment under construction shall be maintained in such condition that the construction equipment can travel on any part of any one section and at no time shall separate pieces of equipment be permitted to track each other. Ruts in the surface of any layer shall be filled

satisfactorily before compacting. Each layer of fill material placed as outlined above shall be brought to within 3 percentage points of optimum moisture content for both clay (CL and CH) and for silt (ML) prior to commencement of compaction. The optimum moisture content for each type of material shall be determined in accordance with ASTM D 698. The actual moisture content of the material to be placed shall, as often as necessary, be checked by the Contractor to assure that the moisture content is within the range specified above, or as directed by the Contracting Officer. This moisture content check shall be performed in accordance with ASTM D 2216 or ASTM D 2922. The Contractor may be required to discontinue all compaction operations until the moisture content of the fill has been adjusted. The Contractor shall perform the necessary work in moisture control to bring the borrow material within the moisture content range specified above. No additional payment will be made for any moisture control required in this paragraph. Each layer of the embankment shall be rolled for the full width of the cross section. The rolling shall continue until a density has been obtained not less than 95 percent of the maximum density for the soil used, as determined by ASTM D 698. Material shall be classified by the Unified Soil Classification System (as shown on the Soil Boring Legend on the drawings.)

3.2.3 Dressing

The entire embankment shall be brought to not less than the prescribed gross cross section, within allowable tolerance, at all points. Unreasonable roughness of surface shall be dressed out to permit turfing operations.

3.3 CROSS SECTIONS AND ZONING OF MATERIALS

3.3.1 Levee Embankment Sections

Unless otherwise specified, the dimensions and slopes shall conform to the applicable cross sections shown on the drawings, within allowable tolerance.

3.3.2 Zoning of Materials for Levee Construction

In general, the levee section, including berms shall be homogeneous; however, where materials of varying permeabilities are encountered in the borrow areas, the more impervious material shall be placed toward the riverside slope, and the more pervious material shall be placed toward the landside slope.

3.3.3 Berms

Berms shall be constructed at the locations and to the grade and cross section shown on the drawings.

3.4 ACCESS ROADS AND RAMPS

3.4.1 Access Roads

3.4.1.1 Location

Access roads shall be located and constructed as approved by the Contracting Officer. They shall be designed to maintain the intended traffic, to be free draining and shall be constructed by placement of fill as specified in paragraph SEMICOMPACTED FILL and shall be maintained in good condition throughout the contract period.

3.4.2 Ramps

3.4.2.1 General

Ramps shall be constructed at the locations shown on the drawings by placement of a fill as specified in paragraph SEMICOMPACTED FILL. Ramps shall be constructed only by adding material to the levee crown and slopes. Ramps shall have a 16 foot crown width, a grade not to exceed 10 percent and 1V on 4H side slopes.

3.4.2.2 Changes in Ramp Dimensions or Locations

The Contracting Officer reserves the right to modify the dimensions and/or shift the locations of the ramps, to eliminate ramp construction, and/or to order the construction of additional ramps at other locations. Any additional costs incurred by the Contractor for additional ramps or modified ramp dimensions will be paid for in accordance with the Contract Clause "CHANGES".

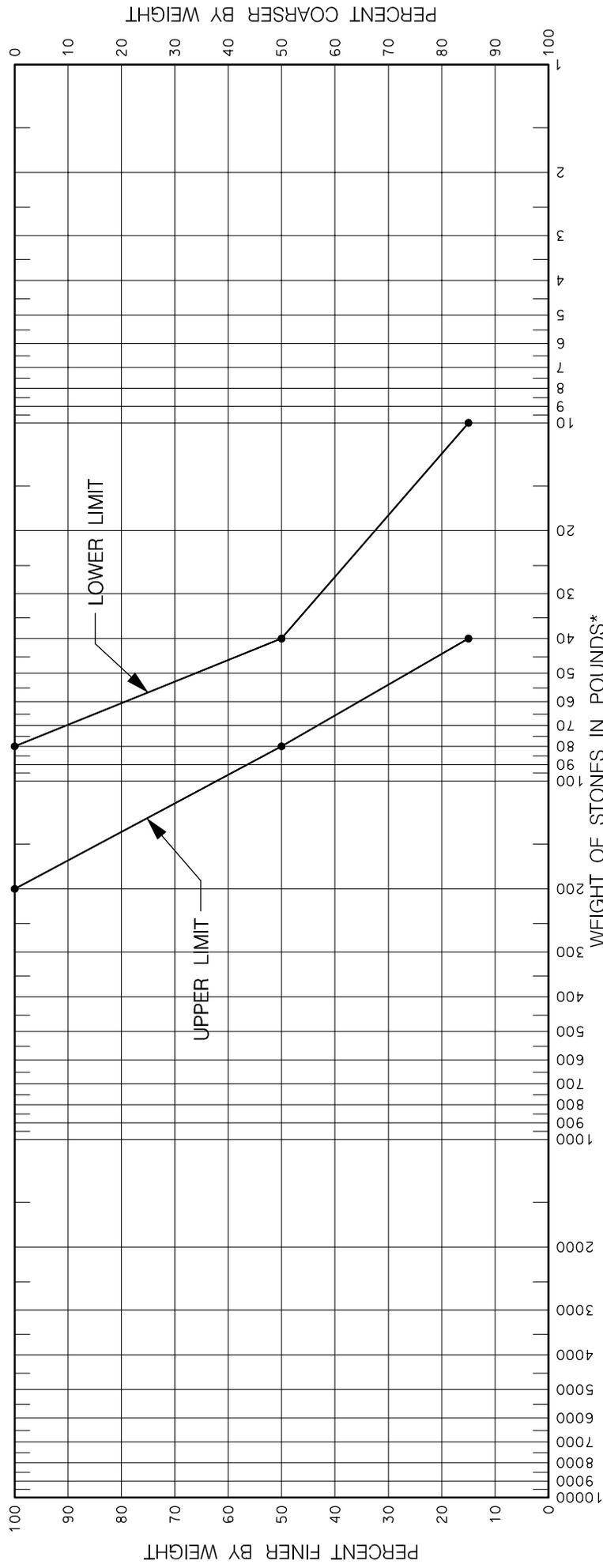
3.5 GRADE TOLERANCES

All embankments shall be constructed to the gross grade and cross section shown on the drawings. The toe of the embankment for the frontline levee enlargement is based on the net grade shown in the drawings. For semicompacted fill at all points, a tolerance of 0.3 feet and for compacted fill at all points, a tolerance of 0.3 feet above or below the prescribed gross grade and cross section shown will be permitted in the final dressing provided that the crown of the levee drains, there are no abrupt humps or depressions in surfaces or bulges in the width of the crown, and the side slopes are uniform. Any partial fill or temporarily stockpiled material placed within the gross section shall not exceed the gross grade or gross slopes of the embankment by more than 2 feet and shall have side slopes not steeper than 1V on 3H. The refilled diversion channel shall be graded and sloped to drain.

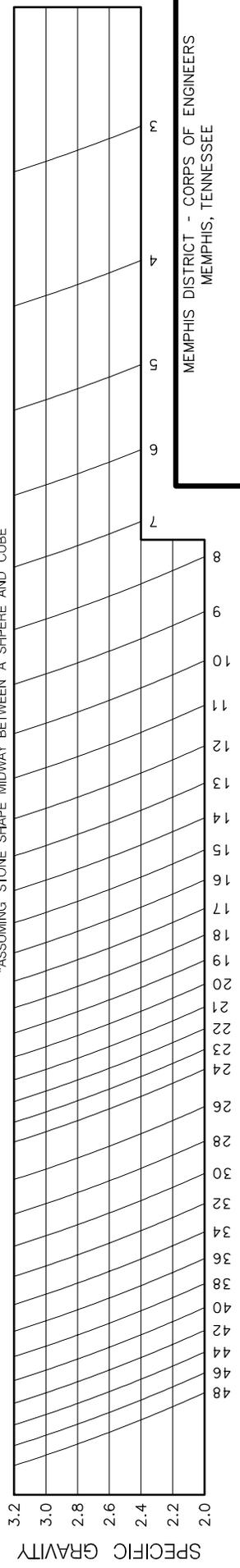
3.6 SLIDES

Should sliding occur in any part of the embankment during its construction, or after its completion, but prior to its acceptance, the Contractor shall upon written order of the Contracting Officer, either cut out and remove the slide from the embankment and then rebuild that portion of the embankment, or construct a stability berm of such dimensions, and placed in such manner, as the Contracting Officer shall prescribe. In case the slide is caused through the fault of the Contractor, the foregoing operations shall be performed at no additional cost to the Government. In case the slide is not the fault of the Contractor, the Contractor shall upon written order of the Contracting Officer, repair the slide by the methods stated above, with payment for this work determined by the provisions of contract clause CHANGES. The method of slide correction will be determined by the Contracting Officer.

End of Section



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



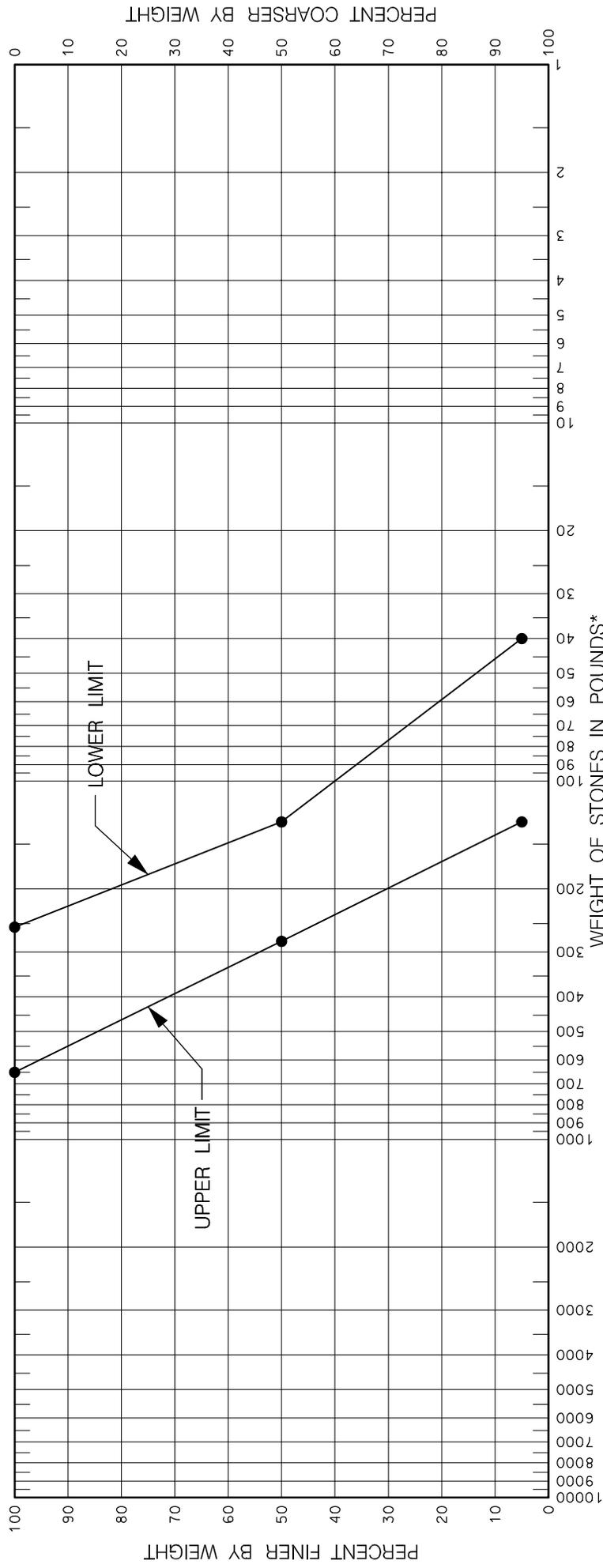
"R-200"

SIZE OF STONE IN INCHES

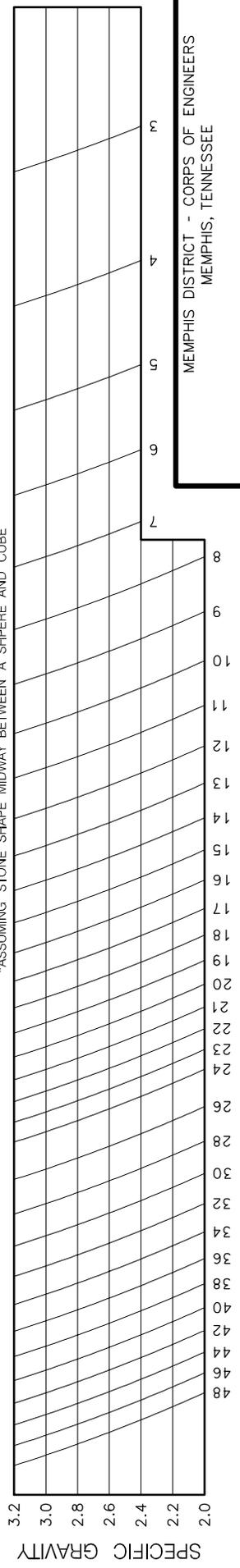
MEMPHIS DISTRICT - CORPS OF ENGINEERS
 MEMPHIS, TENNESSEE

PROJECT: _____ DATE: _____

RIPRAP GRADATION CURVES



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



MEMPHIS DISTRICT - CORPUS OF ENGINEERS
 MEMPHIS, TENNESSEE

"R-650"

PROJECT: _____ DATE: _____

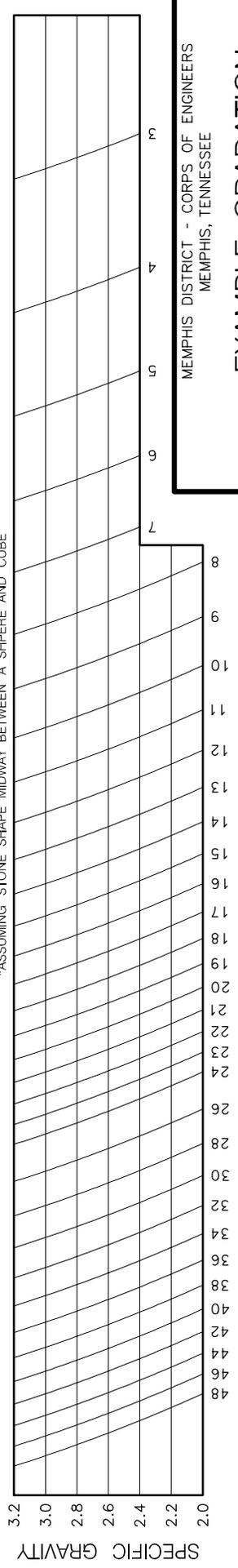
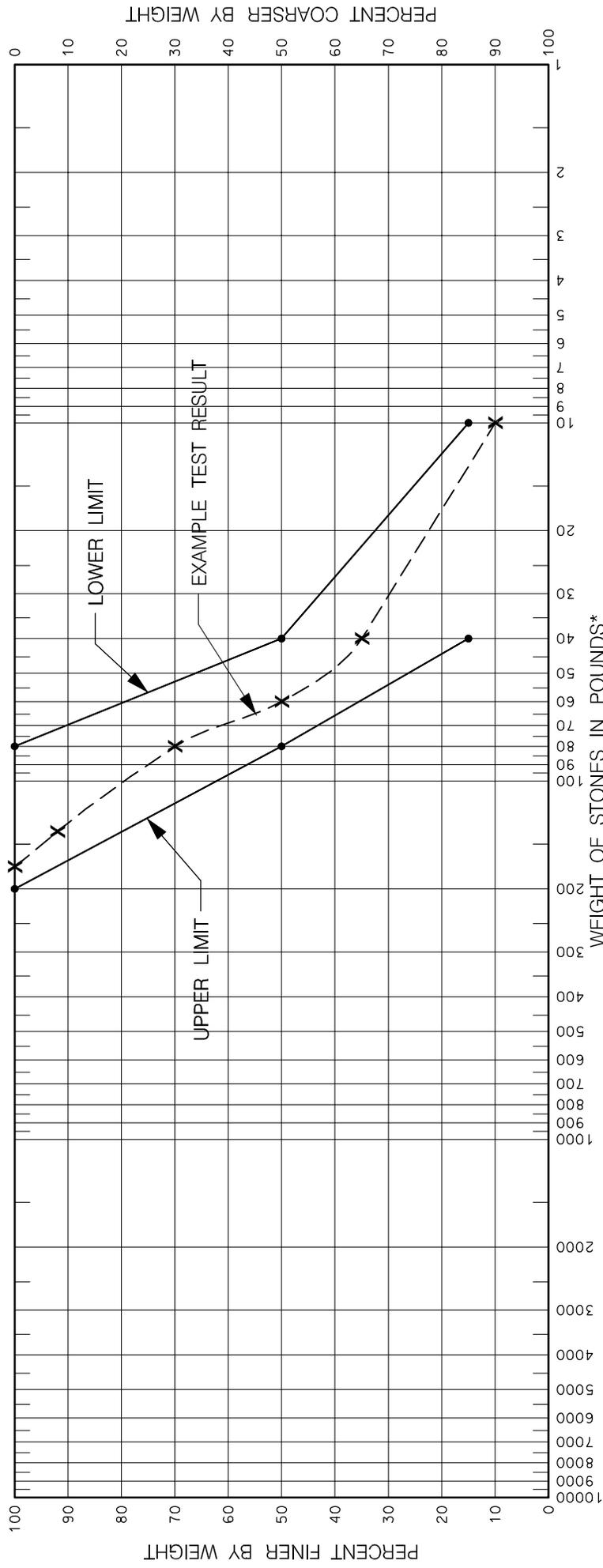
RIPRAP GRADATION CURVES

**EXAMPLE GRADATION - SPECIFICATIONS
BASED ON "R - 200"**

Stone Weight in Lbs.	Percent Finer by Weight
200 - 80	100
80 - 40	50
40 - 10	15

**EXAMPLE GRADATION - WORKSHEET
BASED ON "R - 200"**

Stone Size (lbs)	Weight Retained	Individual % Retained	Cumulative % Ret.	% Pass	Specification % Finer by wt
200	0	0	-	100	
140	3840	8	8	92	
80	10560	22	30	70	
60	9600	20	50	50	
40	7200	15	65	35	
10	12000	25	90	10	
<10	4800	10	100	-	
Total Weight	48000lbs				

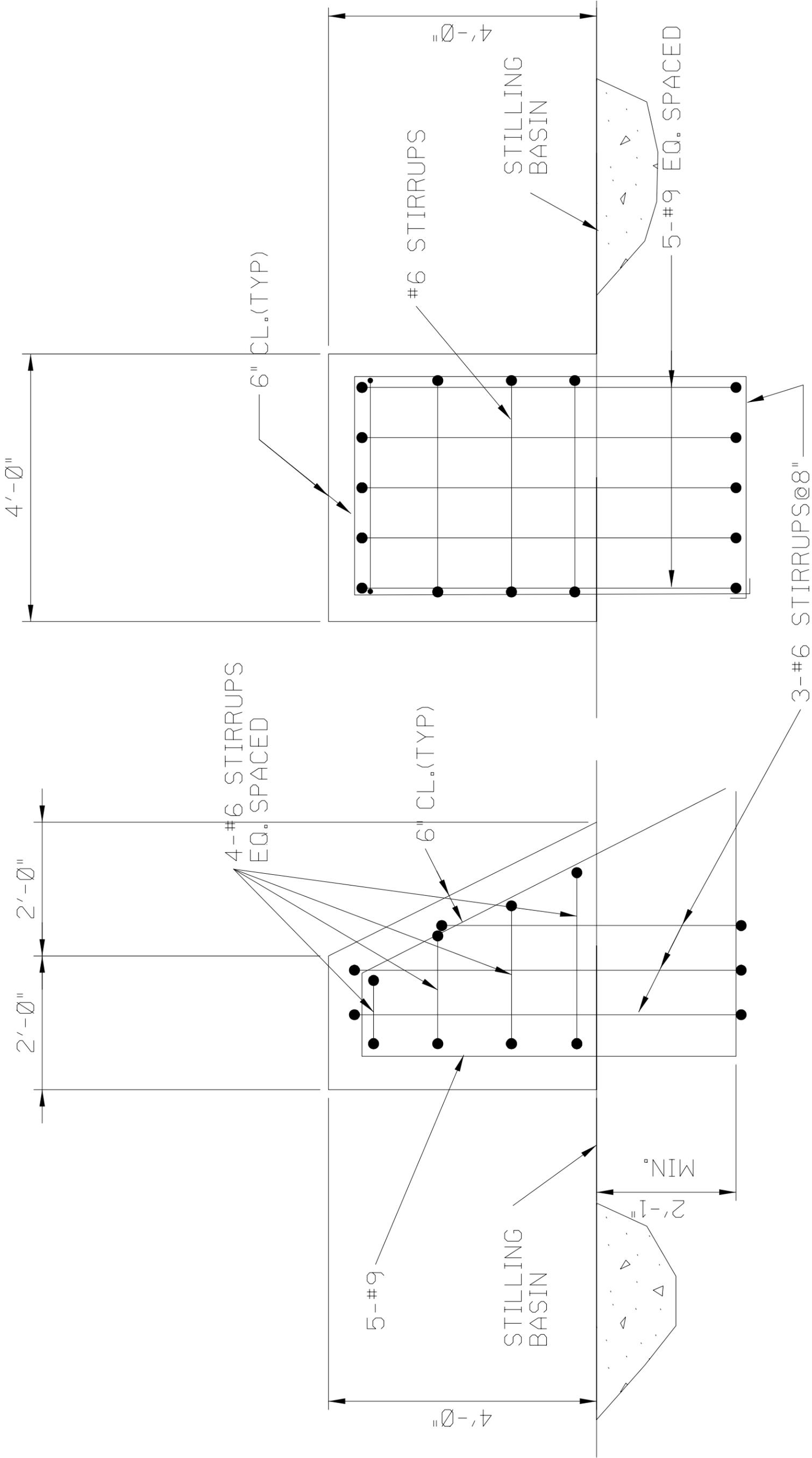


MEMPHIS DISTRICT - CORPS OF ENGINEERS
MEMPHIS, TENNESSEE

EXAMPLE GRADATION
BASED ON "R-200"

PROJECT: _____ DATE: _____

RIPRAP GRADATION CURVES



SECTION

FRONT ELEV

NEW MADRID
PUMPING STATION
BAFFLE BLOCK