

CIVIL-STRUCTURAL
CONSTRUCTION SPECIFICATION
FOR THE
GEORGIA POWER COMPANY
ALVIN W. VOGTLE PLANT
UNITS 1 AND 2
BURKE COUNTY, GEORGIA

SPECIFICATION NO. X2AP01
DIVISION C2
SECTION NO. C2.2
EARTHWORK AND RELATED SITE ACTIVITIES
REVISION 11
FEBRUARY 17, 1984
PROJECT CLASS 01C, 62C

BECHTEL JOB 9510
BECHTEL POWER CORPORATION
LOS ANGELES POWER DIVISION
NORWALK, CALIFORNIA



8412200438 841212
PDR ADOCK 05000424
A PDR

Bechtel Power Corporation
ENGINEERS — CONSTRUCTORS
SAN FRANCISCO LOS ANGELES

CIVIL-STRUCTURAL
CONSTRUCTION SPECIFICATION
FOR THE
GEORGIA POWER COMPANY
ALVIN W. VOGTLE PLANT
UNITS 1 AND 2
BURKE COUNTY, GEORGIA

SPECIFICATION NO. X2AP01

DIVISION C2

SECTION NO. C2.2

EARTHWORK AND RELATED SITE ACTIVITIES

REVISION 11

FEBRUARY 17, 1984

PROJECT CLASS 01C, 62C

JOB NUMBER 9510
BECHTEL POWER CORPORATION
NORWALK, CALIFORNIA

△	9-7-82	General Revision; Incorporate CSCN Nos. 212 and 265	MAP	MM	BSF	QW	X	TH	EL
△	10-23-81	Incorporate CSCN Nos. 182 and 186	TH	MM	BSF	QW	X	TH	EL
△	12-2-80	Incorporate CSCN Nos. 146 and 153 and Minor Changes	TH	MM	BSF	QW	X	TH	EL
△	9-3-80	Incorporate CSCNs 118, 119, 121, and Revised Paragraph Numbering	TH	MM	BSF	QW	X	TH	EL
△	3-18-80	Incorporate CSCN 99 & 103 As Modified	TH	MM	BSF	QW	X	TH	EL
△	9-19-79	Incorporate CSCN Nos. 40, 57, 61, 71, 72, 73, 74, 75, 77 and 80; and Misc. Revisions pp. 4, 5, 10, 12, 17, 18, 21, 22 and 23 per meeting at jobsite held 6-26-79	TH	MM	BSF	QW	X	TH	EL
△									
△	2-20-79	Issued for Construction	TH	MM	BSF	QW	X	TH	EL
REV. NO.	DATE	REVISIONS	ENG	CHK.	EGS	APR	PE	PO-AE	LIC ENG

REV. NO.	DATE	REVISIONS	ENG	CHK	DES	APP	RE	PO- AE	LIC ENG
1	12-10-82	General Revision; Incorporated CSCN Nos. 289, 307, and 313							
2	2-25-83	General Revision; Incorporated CSCN Nos. 303, 312, and 322.							
3	6-24-83	Incorporated CSCN Nos. 347, as modified, (C2.2.7, B, 3, q); C355 (C2.2.7, C, 5); C356, as modified, (C2.2.7, C, 5)							
4	9-9-83	Incorporated CSCN No. 367 (2.2.7, C, 9) as modified							
5	2-17-84	Incorporated CSCN Nos. 420, 425, 426, 430, 432 and 434 (Paragraphs C2.2.7, C.5 and C2.2.7, C.15.8)							
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									
61									
62									
63									
64									
65									
66									
67									
68									
69									
70									
71									
72									
73									
74									
75									
76									
77									

CONTENTS

	<u>Page</u>
C2.2.1 PURPOSE	1
C2.2.2 QUALITY STANDARDS	1
C2.2.3 SCOPE	3
C2.2.4 SITE PREPARATION	5
C2.2.5 DEWATERING	6
C2.2.6 EXCAVATION	9
C2.2.7 EMBANKMENT AND BACKFILL	16
C2.2.8 EROSION CONTROL	42
C2.2.9 DRAINAGE	46

C2.2.1 PURPOSE

This section covers the requirements for Site Preparation and Earthwork. The Contractor shall furnish all tools, equipment, utilities, facilities, etc., and shall perform all labor and services necessary for the proper execution and completion of the work.

C2.2.2 QUALITY STANDARDS

A. GENERAL

GPC and/or the Contractor performing this work shall control their activities so that the quality of items and services

will meet the requirements of this specification, applicable Codes and Standards, and other contract documents.

B. REFERENCED CODES AND STANDARDS

Codes and standards referenced in this section of this specification include, but are not limited to, those listed below.

Codes and standards used in conjunction with this section for which the date of issue is not indicated below shall be of the date of issue in effect upon issuance of Revision "0" of this section.

<u>Sponsor</u>	<u>Number</u>	<u>Subject</u>
ASTM	A 185-72	Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement
ASTM	A 615-72	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM	C 33-71	Standard Specification for Concrete Aggregates
ASTM	C 39-72	Test for Compressive Strength of Cylindrical Concrete Specimens
ASTM	C 150-73	Standard Specification for Portland Cement
ASTM	C 309-74	Liquid Membrane - Forming Compound for Curing Concrete
ASTM	C 654-70T	Tentative Specification for Porous Concrete Pipe
ASTM	D 422-63(1972)	Particle - Size Analysis of Soils

ASTM	D 423-66(1972)	Test for Liquid Limit of Soils
ASTM	D 424-59(1971)	Test for Plastic Limit and Plasticity Index of Soils
ASTM	D 448-54(1973)	Spec. for Standard Sizes of Coarse Aggregate for Highway Construction
ASTM	D 1140-54(1971)	Amount of Material in Soils Finer Than No. 200
ASTM	D 1556-64	Standard Method of Test for Density of Soil in Place by the Sand-Cone Method
ASTM	D 1557-70	Standard Methods of Test for Moisture-Density Relations of Soils Using 10-lb Rammer and 18-in. Drop
ASTM	D 2167-66	Standard Method of Test for Density of Soil in Place by the Rubber Balloon Method
ASTM	D 2216-71	Standard Method of Laboratory Determination of Moisture Content of Soil
ASTM	D 2922-71	Standard Methods of Test for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
AASHTO	M 36-74	Standard Specification for Zinc Coated (Galvanized) Corrugated Iron or Steel Culverts and Underdrains
AASHTO	M 148-74	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
AASHTO	M 167-72	Standard Specification for Structural Plate for Pipe, Pipe-Arches and Arches
AASHTO	M 176-74	Standard Specification for Porous Concrete Pipe
AASHTO	M 182-60 (1974)	Standard Specification for Burlap Cloth Made from Jute or Kenaf

AASHTO	M 190-70 (1974)	Standard Specification for Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches.
AWWA	C 201-66	Standard for Fabricated Electrically Welded Steel Water Pipe
DOT	164 (1977)	Straw Mulch Stabilization
DOT	205 (1977)	Roadway Excavation
DOT	208 (1977)	Embankments
OSHA		Occupational Safety and Health Administration (Current)

C. QUALITY REQUIREMENTS

The following paragraphs shall be in compliance with
Section C2.16, Quality Assurance Requirements:

1. Paragraph C2.2.5,D - Pipe Net Work.
2. Paragraph C2.2.6,C - Power Block Excavation Including
Blasting and Marl Protection.
3. Paragraph C2.2.7,C - Power Block Compacted Backfill,
Including Testfill.

C.2.2.3 SCOPE

A. WORK INCLUDED

Earthwork and related site activities shall include but shall
not be limited to the following items:

1. Clearing and grubbing.
2. Disposal of cleared and grubbed material.
3. Excavation.
4. Compaction.
5. Stockpiling.
6. Dewatering.
7. Erosion control.
8. Compacted embankment and backfilling.
9. Installing pipes and pipe-arch culverts.

10. Rough grading for railroad track.
11. Grade surveys.

B. WORK NOT INCLUDED

The following items of work are not included in this specification.

1. Base survey control.
2. Quality control of earthwork.
3. Evaluation of acceptable foundation elevation.

C. SUBSURFACE INFORMATION

The soils exploration data compiled in connection with the PSAR report for the A. W. Vogtle Nuclear Plant will be available for inspection to Contractors. Such data are solely for the convenience of the Contractor. It is expressly understood and agreed that the Owner assumes no responsibility whatsoever with respect to the sufficiency or accuracy of the investigations thus made, the records thereof, or of the interpretations set forth therein or made by the Owner in his use thereof and there is no warranty or guaranty, either expressed or implied, that the conditions indicated by such data are representative of those existing throughout such areas, or any part thereof, or that unforeseen developments may not occur, or that materials other than, or in proportions different from those indicated, may not be encountered.

D. INSTRUMENTATION

1. Nine heave points have been installed in the power block structures area, as shown on drawings. Each heave point consists of an anchor embedded in the marl 5 feet below the eventual bottom of the excavation and a 2 inch diameter PVC pipe rising vertically from the anchor to the ground surface. The Contractor shall, at all times during the progress of the excavation, ensure that the PVC pipes protrude above the ground surface. Excess pipe will be removed by others. Heave points shall be abandoned upon completion of excavation or upon commencement of backfill at the heave point location, as determined by the Owner.
2. The Contractor shall, throughout all excavation and backfilling operations protect from damage all benchmarks, control monuments, and settlement survey markers subsequently placed by others unless otherwise specified by the Owner. Any benchmark, control monument, or settlement marker damaged or destroyed by the Contractor shall be replaced by the Contractor at no additional expense to the Owner.

C2.2.4 SITE PREPARATION

A. CLEARING AND GRUBBING

1. General

All cleared and grubbed materials shall become the property of the Contractor and shall be removed from the site of the work or disposed of in accordance with the provisions of Paragraph C2.2.4.B.

2. Clearing

- a. Clearing shall consist of the felling and cutting of trees and clearing of all brush, perishable materials of whatsoever nature, and removal of topsoil.
- b. Where the area cleared is not to be grubbed, the height of stumps above ground shall not exceed the smallest diameter of the stump at its top and in no case shall the height exceed 18 inches.
- c. All trees, except trees designated to remain in place; stumps, brush, timber, fences, buildings, debris and buried abandoned pipe shall be cleared. Trees that are designated in the field by the Owner to remain in place shall be protected from damage.
- d. Grass, weeds, or similar organic matter shall be removed from the surfaces of foundations for embankments and from the debris basin area.
- e. Existing roads which are to be abandoned shall be demolished by rooting, pulverizing, or scarifying to a minimum depth of 6 inches or to the bottom of the underlying aggregate base material, whichever is lower. Bituminous material shall be broken into pieces of 4 inches or smaller in the greatest dimension and shall be mixed with the underlying aggregate base material. The loosened material shall be shaped to provide a presentable and well drained area.

3. Grubbing

- a. Grubbing shall be done at debris basin area and at the locations of excavations and embankments, to the limits shown on the drawings, and shall include the complete removal of all trees, stumps, roots and other embedded or buried debris. The other areas designated for grubbing and as shown on drawings shall be similarly cleared.
- b. All stumps and roots larger than 3/4-inch diameter shall be removed to a depth of not less than 3 feet.

- c. Grubbing shall include the removal of any buried logs and similar organic material.

4. Stripping

The Contractor shall strip all areas of excavation and embankment to a depth of 1 foot to the limits shown on the drawings or as required by the Owner.

B. DISPOSAL OF CLEARED GRUBBED AND STRIPPED MATERIALS

1. General

Unless otherwise required all combustible material resulting from clearing and grubbing shall be burned or removed from the site of the work as required by the Owner. Piling for burning shall be done in such a manner and in such locations as to minimize the fire risk, and shall be re-piled and re-fired as many times as it is necessary to ensure complete burning. The Contractor shall be responsible for prevention and suppression of fires and any damages caused by his burning operations. Permits, if required, shall be obtained from local authorities and all county regulations adhered to before any burning is undertaken. The Contractor shall have available, at all times, sufficient personnel and suitable equipment and supplies for use in controlling and suppressing fires.

2. Methods of Clearing and Grubbing

Clearing and grubbing may be done by any method that is not detrimental to the work or that is not wasteful of earth materials required for backfill or embankment construction.

3. Progress

Clearing and grubbing operations shall be carried out sufficiently far in advance of other operations so that they will not interfere with or delay such operations.

C2.2.5 DEWATERING

A. GENERAL

1. This work shall consist of installing and operating a dewatering system of sufficient size and capacity to control hydrostatic pressure inside the excavation slopes and to permit all material to be excavated in a dry condition to allow the placement of concrete.
2. The Contractor shall satisfy himself as to the nature and location of the work, and general, local and physical conditions of the ground at the site. Any failure on the part of the Contractor to acquaint himself with the existing

conditions will not relieve him from his responsibility of completing the work in its entirety as required.

3. The system shall be maintained in continuous operation by the Contractor until a written directive to cease dewatering operations has been received from the Owner.
4. The Contractor shall control, by approved methods, all water regardless of source. Water shall be controlled and its disposal provided at the base of the excavation. The entire periphery of the excavation shall be ditched and diked as shown on the drawings or as required to prevent water from entering the excavation.
5. The capacities of pumps are shown as the minimum requirements. The Contractor shall refer to Mr. Robert Bush's report dated January 12, 1973, available from the Owner as a guidance for his design of the dewatering system.

B. DRAWINGS

The general arrangement of a suggested dewatering system is shown on the drawings. The Contractor shall submit a description of the methods with drawings and a complete list of the equipment including standby equipment which he proposes to use for dewatering and disposal of water. Use of any other method proposed by Contractor shall be subject to the approval of the Owner. The Contractor shall be responsible for the successful operation of the dewatering system.

C. PUMPS AND ACCESSORIES

1. Data to be Furnished

- a. Unless otherwise permitted in writing by the Owner, the Contractor shall within 60 days after approval of the contract, submit to the Owner, lists of material and equipment for the dewatering system which he proposes to install, and complete working drawings showing fully the work he proposes to do and related data.
- b. Installation of equipment will not be permitted until the material lists have been reviewed by the Owner. Specifications and performance curves shall be submitted for the dewatering pumps.

2. Standby Emergency Power Equipment

The Owner will provide a standby emergency diesel generator(s) of sufficient capacity to enable the Contractor to operate all dewatering pumps in case of an interruption of electric power.

D. PIPE NET WORK

1. General

This work shall consist of installing porous concrete pipe, discharge pipe, and placing filter material as shown on the drawings, or as directed by the Owner and as specified herein.

2. Materials

- a. Porous concrete pipe shall conform to the specifications of ASTM Designation C 654 or AASHTO M 176.
- b. Discharge pipes shall be steel pipe as specified under AWWA C201, unless otherwise specified by the Owner.
- c. Filter material for use in backfilling trenches where porous pipe will be laid, shall consist of hard, durable, clean sand, gravel, or crushed stone, and shall be free from organic material, clay balls or other deleterious substances. The percentage composition by weight of filter material in place shall conform to the following gradation limits.

<u>U.S. Sieve Sizes</u>	<u>Percent by Weight Passing</u>
3/8"	100
No. 4	70-100
No. 10	30-65
No. 40	0-10
No. 200	2% max.

No. 9 stone in accordance with ASTM D 448 may be substituted for the material described above if it is in contact with material comparable to "Stockpile A" material, placed as shown on Drawing AX2D46T010 and conforms to the following gradation limits:

<u>U.S. Sieve Sizes</u>	<u>Percent By Weight Passing</u>
3/8"	100
No. 4	85-100
No. 8	10-40
No. 16	0-20
No. 50	0-10

3. Installation

- a. Trenches for discharge pipes and porous concrete pipes shall be excavated conforming to the provisions in Paragraph C2.2.6,E "Trenching."
- b. Installation of discharge pipes and porous concrete pipes and backfilling of trenches with filter material shall be in accordance with the dimensions and details shown on the drawings or as required by the Owner.

C2.2.6 EXCAVATION

A. GENERAL

1. This section covers the Contract items excavation for power block, excavation for ditches, trenching, excavation for roadways, excavation for structures and the cooling tower area Units 1 and 2, switchyard areas, construction parking area, batch plant area, construction facility area, railroad yard area and work related to these items.
2. The Contractor shall take all measures and precautions to preserve, in an undisturbed condition, material beyond the designated lines of the excavations, provided that unsuitable material shall be removed when required by the Owner. Material loosened or over excavated beyond the excavation limits as a result of excavation operations shall be removed and replaced with compacted embankment, compacted backfill or as directed by the Owner.
3. The Contractor shall provide drainage ditches and miscellaneous structures necessary to prevent ponding of water in areas of excavation.
4. The bottom of all excavations shall be cleared of all loose material. Unauthorized or overexcavations shall be restored to the Owner's satisfaction at the Contractor's expense. Unsatisfactory material below elevations shown on the drawings shall be removed, and replaced with compacted material or as required by the Owner. Bottoms of all excavations shall be drained and maintained in such a manner as to prevent freestanding water.

B. SECTIONS AND SLOPES

1. Excavation sections and slopes shall be cut true and straight in conformity with the lines and grades shown on the drawings within tolerances of ± 0.2 foot.
2. The slopes of embankments and excavations shall be as indicated on the drawings or as required by the Owner. In no case shall they be steeper than the following

inclination, as expressed in the ratio of the horizontal distance to the vertical rise.

- a. Temporary embankments equal to or less than 3 feet in height shall be maintained with stable side slopes.
 - b. Temporary excavations equal to or less than 3 feet in depth shall be maintained with stable side slopes.
 - c. Temporary embankment slopes exceeding 3 feet in height in power block backfill shall be 1.5 to 1.0.
 - d. Temporary excavation slopes exceeding 3 feet in depth in power block backfill shall be 1.5 to 1.0.
 - e. All other embankment slopes shall be 2.0 to 1.0.
 - f. All other excavation slopes shall be 2.0 to 1.0.
 - g. Temporary excavation and embankment slopes exceeding 3 feet in depth in Category 2 backfill, compacted to 95 percent of the maximum dry density determined in accordance with ASTM D 1557, shall be a maximum of 1.5 to 1.0.
3. The cut and fill slopes for roadway and ditches as shown on the plans shall be based on the following criteria:
- | | | |
|----|-----------------------|--------|
| a. | 8' - 0 fill and under | 3 to 1 |
| b. | Over 8' - 0 fill | 2 to 1 |
| c. | 6' - 0 cut and under | 3 to 1 |
| d. | Over 6' - 0 cut | 2 to 1 |
4. Should materials of unexpected nature be encountered, or unforeseen conditions arise at any time after the excavation or embankment has been started, the Owner may require steepening or flattening or benching slopes without any right or claim by Contractor other than for the quantity of material actually moved.

C. EXCAVATION OF POWER BLOCK

1. The Contractor shall perform all operations and incidentals necessary to complete the excavation, dispose of waste material and stockpile material for the power block area backfill as shown on the drawings or as required by the Owner.

2. The Contractor may employ blasting methods to remove hard limestone deposits from the excavation subject to the following requirements:
 - a. Blasting methods are for removal of hard limestone deposits only.
 - b. The Contractor shall not use blasting methods when conventional excavation techniques and ripping are possible.
 - c. Whenever, in the opinion of the Engineer, blasting might damage the marl foundation upon or against which concrete is to be placed, the use of explosives shall be discontinued. In this case removal of material shall be accomplished by hand methods and/or pneumatic tools by wedging, barring, and picking or other methods accepted as standard in the industry.
 - d. All blasting shall be carried out with proper practices for protection of persons and property public and private.
 - e. The Contractor shall submit his blasting plan and procedure to the Owner for approval prior to implementation.
 - f. The Contractor shall comply with all applicable local, state, and federal regulations governing use of explosives.
 - g. The Contractor shall arrange his pattern so as to blast to a free vertical face, rather than lifting the material.
 - h. No blast holes may penetrate lower than elevation 135.0 feet.
 - i. Explosives must not be concentrated in the bottom of the hole and a minimum stem of 18 inches should be used in the bottom of all holes.
 - j. No blasting holes shall exceed 3 inches in diameter.
 - k. Maximum charge weight shall not exceed 30 pounds per delay.
 - l. No blasting shall be permitted within 200 feet of fresh concrete or grout. If blasting is necessary within 100 feet of heave and settlement monuments, readings shall be taken on such monuments before and after blasting.

- m. The maximum allowable powder factor shall be 1 pound per cubic yard.
 - n. A qualified Geologist shall be on site during all blasting operations.
- 3. Material will be classified by the Owner or his representative. Sand and silty sand shall be stockpiled for fill, all other materials shall be wasted in approved areas.
 - 4. In the excavation at the power block area the Contractor shall take all precautions necessary to protect the foundation from damage. Hauling over the finished foundation grade shall be limited to that which is essential for construction purposes. The foundation shall be maintained free of standing water and in a free draining condition to existing drain outlets at all times during foundation excavation and preparation. Any equipment used for hauling over prepared foundation, which in the opinion of the Owner, is causing undue damage to the prepared foundation surface or to the underlying materials shall be removed from the work at the request of the Owner.
 - 5. Acceptable foundation on marl for Category I structures:

The Contractor shall excavate into marl until the excavation reaches acceptable foundation material at or below the elevations shown on drawings. Acceptable foundation material shall satisfy all of the following requirements:

- a. A freshly excavated plane and horizontal surface in marl shall appear homogeneous without any soft or loose material.
- b. The undrained shear strength shall exceed 10 kips per square foot.
- c. The excavated surface shall be inspected and approved in writing by the Owner.

After acceptance of the foundation by the Owner, no vehicle or equipment shall be permitted on the foundation without the Owner's approval.

6. Marl Protection

- a. Horizontal surfaces where no structures occur above shall be protected by 6 inches of backfill compacted to the requirements of Paragraph C2.2.7,C, and as shown on the drawings.

- b. Horizontal surfaces in marl where structures occur shall be covered by a protective concrete mat. Concrete shall produce a minimum 2000 psi ultimate compressive strength as specified in Division C3.6 of this specification. The protective mat shall be placed no later than 24 hours after exposing the final foundation surface to the air, unless otherwise required by the Owner. The concrete shall be placed within a tolerance of plus or minus 0.04 foot to the elevations shown on the drawings.
 - c. The exposed slopes of the excavation into the marl shall be protected by air-blown mortar in accordance with Paragraph 2.2.9,D.
7. Existing Standby Well at Power Block Units 1 and 2

The Contractor shall remove portions of the existing standby well during the excavation of the power block as specified in Section C2.3 of this specification and as required by the Owner.

D. EXCAVATION FOR DRAINAGE DITCHES

The Contract item excavation for ditches includes removal and disposal of material for the excavation for channels leading to or away from culverts and intercepting ditches at top of all cut slopes as shown on the drawings or as required by the Owner.

E. TRENCHING

- 1. The Contract item trenching includes all excavation required for the installation of discharge pipes and porous concrete pipes. Trenching operations shall be conducted in such a manner as to offer the least possible obstruction and inconvenience to construction traffic.
- 2. Excavated material not used in backfilling operations shall be disposed of as required by the Owner.
- 3. Dimensions
 - a. The maximum length of open trench shall be that length necessary to permit uninterrupted construction progress.
 - b. Unless otherwise required by the Owner, trenches shall not be less than 12 inches wider nor more than 20 inches wider than the outside diameter of the pipe up to a plane 6 inches above the top of the pipe, except where sheeting is used.

4. Sheeting

Sheeting shall be removed in a manner to prevent caving of the sides of the trench. Portions of sheeting in contact with concrete may be left permanently in place. Portions of sheeting above concrete can be cut off after concrete sets.

5. Subgrade of Pipe

The subgrade shall be shaped to support the lower 1/4 segment of the pipe or as shown on drawings for its full length except at joints where adequate space for proper joint construction shall be provided.

6. Bedding

Remove loose, soft, or compressible material in the subgrade and replace with clean sand and compacted as specified in Section C2.2.7.

7. Hard Bedding

When the bottom of the excavation cannot be excavated to a required subgrade line because of rocks, hardened clays and other materials difficult to excavate to a true subgrade, the trench shall be overexcavated at least 6 inches below subgrade and backfilled with clean sand and compacted as specified in Section C2.2.7.

8. Overexcavation

Overexcavation shall be backfilled with clean sand and compacted to the same degree as the adjacent backfill material.

F. EXCAVATION FOR ROADWAYS

Excavation for Main Plant Road and other access roads as shown on drawings shall be in accordance with the applicable provisions of Section 205 of the State of Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges, 1977 Edition (DOT).

G. GRADING

The rough grading of the contract area shall be done in accordance with the rough grading drawings and as required by the Owner.

H. USE AND DISPOSAL OF EXCAVATED MATERIAL

1. Suitable materials from excavations, shall be used either for backfill in the power block area or for constructing the embankments outside of the power block area.
2. Compacted Embankment - Sand, silty sand, clayey sand from required excavation may be used in the construction of embankment. The material shall be free of all organic material and of all material larger than 5 inches in maximum dimension.
3. Power Block Compacted Backfill
 - a. Sand and silty sand excavated from the power block area and stockpiled separately near the site may be used for power block backfill. Designation of these areas does not mean that all the stockpiled material will be acceptable for the power block backfill. Before stockpiled material is used the suitability of the stockpiled material for use in power block backfill shall be determined by the Owner or his representative. Depending on the quantity of backfill materials required, additional sources for the backfill may be designated within the plant site boundary. The suitability of materials from sources other than the stockpiled areas shall be determined by the Owner or his representative and shall be approved by Bechtel. Designation of additional borrow sources does not mean that all the materials in those areas will be acceptable for the power block backfill. All material for power block backfill shall be free of all organic material and shall not include material larger than 3 inches in maximum dimension.
 - b. The Category I backfill in the power block shall consist of sand and silty sand material obtained from approved stockpiles or borrow areas. Sand, silty sand backfill to be used in power block backfill shall not contain more than 25 percent passing the U.S. No. 200 Sieve. Periodic gradation tests in accordance with ASTM D 422 (Section 5) and ASTM D 1140 shall be performed on representative samples of the backfill material to ensure that only materials conforming to the above requirements are used for the powerblock backfill. The Contractor shall perform testing on representative soil samples from the borrow areas at the time of excavation. A minimum of one test in accordance with ASTM D 1140 for every 5000 cubic yards of Category I backfill material or a minimum of one test per day when excavation is being carried out in the borrow areas, whichever is the greater number, is required to monitor the quality of the backfill material. In addition, a minimum of one gradation test of backfill

material shall be performed in accordance with ASTM D 422 (Section 5) for every 25,000 cubic yards of Category 1 backfill material. If non-uniform soil conditions exist in the borrow areas more gradation tests will be required to establish the material suitability and to eliminate unsuitable materials, and therefore the extent of required additional testing should be determined by the Contractor's field personnel responsible for the excavation work and monitoring the quality of backfill materials. The gradation testing specified above will be in addition to any other gradation tests that will be performed in conjunction with field testing to establish the quality of the compacted backfill as required in C2.2.7,C,1.

4. Area Fill and Fill for Drainage - All excavated materials that are free of organic material and oversize material that would prevent the placing of material in lifts of the thickness specified in Paragraph C2.2.7,D are suitable for the construction of area fill embankment.
5. Waste - All excess suitable material and material that is unsuitable for compacted embankment, compacted backfill or area fill shall be placed in the disposal area to the lines and elevations shown on the drawings, or wasted as designated by the Owner.

I. OVERHAUL

1. Overhaul consists of hauling excavated materials beyond the free-haul distance. The distance such material is hauled will be taken as the distance between the center of volume of excavation and the center of volume of the material as deposited, less 1,000 feet of free-haul. Any additional haul due to circuitous travel shall not be considered. Vehicles used for hauling shall be satisfactory to the Owner and shall be sufficient in number and capacity for the work involved. When directed by the Owner the Contractor shall route his hauling equipment over the grade in such a manner as to make maximum use of the compactive effort afforded thereby.
2. Overhaul will be applied to excavation in the general plant area, excavation in the power block area, and excavation in ditches.

C2.2.7 EMBANKMENT AND BACKFILL

A. GENERAL

1. This section covers the contract items compacted embankment, compacted backfill and roadway embankment. The type of

equipment and methods employed in moisture conditioning and compacting of embankment shall be at the option of the Contractor as approved by the Owner.

2. Roadway Embankment shall be in accordance with the applicable provisions of Section 208 DOT, unless otherwise specified.

B. COMPACTED EMBANKMENT (CATEGORY 2 BACKFILL)

1. General

This article covers the contract item compacted embankment which includes construction of fills beneath and adjacent to non-Category I structures at the cooling tower areas, construction facility area and switchyard area. No fill shall be placed until the foundations have been approved by the Owner.

2. Foundation Preparation - Surfaces other than marl or lean concrete upon which embankment is to be constructed shall be scarified to a minimum depth of 12 inches, moisture conditioned, and compacted to not less than 95 percent of the maximum density determined by ASTM D 1557. Material unsuitable for embankment foundations shall be removed as directed and replaced with suitable material and compacted as compacted embankment.
3. Construction of Embankment - Material for embankment shall be as specified in Paragraph C2.2.6,H.
 - a. Material shall be moisture conditioned to the degree necessary to achieve the specified compaction. Discing or other approved methods shall be carried out to blend the added moisture to obtain uniform distribution throughout the layer. Material which contains excess moisture shall be dried until the required compaction can be obtained.
 - b. The materials shall be moisture conditioned at the time of compaction such that the specified compaction may be obtained with the equipment being used. At all times it shall be the responsibility of the Contractor to employ such means as may be necessary to secure a uniform moisture content throughout the material being compacted.
 - c. Embankments shall be constructed in horizontal layers which extend the full width of the embankment. Thickness of the layers shall not exceed 6 inches in uncompacted thickness. When a layer of material is dissimilar from the preceding layer only on approval shall the materials be blended by discing, mixing, scarifying, or a combination of these methods. Compacted embankment

beneath non-Category I structures shall be compacted to an average of 95 percent of the maximum dry density determined in accordance with ASTM D 1557 with not more than 10 percent of the tests between 95 and 93 percent and no test below 93 percent. The average compaction shall be evaluated for sets of up to twenty field density tests made after placement in any area in which the fill is placed. The average compaction of up to twenty field density tests need not be determined if no test in the set falls below 95 percent. An area in which fill is placed shall be any contiguously placed area whose maximum depth is one foot and whose maximum area is 1,000,000 square feet. Compacted embankment beneath parking areas, laydown areas and areas as shown shall be compacted to 90 percent of the maximum density determined by ASTM D 1557. Field density shall be determined by ASTM D 1556 and moisture content of soil shall be determined by ASTM D 2216. The quality of embankment shall be monitored by performing a minimum of one field density test for every 50,000 square feet of fill placed per foot of depth. Areas less than 50,000 square feet which are compacted separately from adjacent material shall be monitored by performing a minimum of one field density test per foot depth. Areas compacted by vibratory or other approved hand operated power tampers shall be monitored by performing a minimum of one field density test for every 5000 square feet of fill placed per foot depth. Areas less than 5000 square feet which are compacted by hand compactors separately from adjacent material shall be monitored by performing a minimum of one field density test per foot depth of fill placed.

- d. Field density may be determined by ASTM D 2922 method provided it is approved by the Owner and provided that daily field density checks are also made using ASTM D 1556 method. If ASTM D 2922 method is used for field density determination, the nuclear device should be calibrated every day using ASTM 1556. Field density test in any test embankment shall be done by ASTM D 1556 only.
- e. The Contractor shall keep the top of the embankments during construction at such elevation and section to provide natural surface drainage at all times. If the Contractor stops work on any portion of the embankment on account of rain or impending rain, the surface shall be graded to facilitate drainage and the surfaces shall be sealed by passing rubber tired equipment or flat drum rollers over the surface. Before work is resumed in the area, the surface shall be scarified to a depth of not less than 6 inches, moisture conditioned, and recompacted to the specified density.

- f. Should the Owner determine that any portion of the surface of the embankment has become so dry or glazed during construction that bond with the succeeding layer to be placed thereon cannot be obtained or should ruts and roadways develop on the embankment such surfaces shall be scarified to a minimum depth of 6 inches, releveled, moisture conditioned, and recompacted to the specified density just prior to placing of the succeeding layer of embankment.
- g. All surfaces of completed embankment slope and profile surfaces shall be compacted to the lines shown on the drawings with a tolerance of plus or minus 0.2 foot and shall be graded to a uniform surface. Surface of compacted embankment shall be maintained at higher elevation than area fill during construction of the compacted embankment.
- h. During placing and compacting of the first 4 feet of embankment, the water table shall be maintained below the elevation of the foundation upon which the embankment is being placed or compacted. During placement and compaction of the embankment above the first 4 feet of embankment, the water table at any point shall be maintained at least four feet below the surface of the embankment being placed, or compacted.
- i. No material shall be placed upon a frozen surface nor shall any snow, ice or frozen earth be incorporated in the embankment. Unless approved, placement operations shall be suspended when the ambient temperature is 32 F or below.
- j. The embankment surface shall be crowned at all times during the construction so that water will readily drain off. Unless otherwise shown or approved, all embankment zones shall be placed with equipment traveling parallel to the centerline and shall be raised simultaneously. The differential elevation between adjacent zones shall not exceed 2 feet.
- k. In areas outside the power block where embankment is compacted to 95 percent, backfill for ditches shall be compacted to 95 percent of the maximum density determined by ASTM D 1557. In areas outside the power block where embankment is compacted to 90 percent, backfill for ditches shall be compacted to 90 percent of the maximum density determined by ASTM D 1557.
- l. Backfill shall be placed and hand compacted to a minimum of 3 feet depth above the top of embedded items (pipe, drains, conduit, etc.) before the use of rollers and heavy equipment.

- m. Backfill material shall be deposited in layers 6 inches or less in uncompacted thickness and compacted as defined above.
- n. When a field density test is carried out which indicates that the percent compaction has not been met, the material represented by the failing test shall be removed and replaced or moisture conditioned, reworked in accordance with Paragraph C2.2.7,B, recompact and retested.
- o. Roadway embankment shall be compacted to not less than 95 percent of its maximum density determined by ASTM D 1557 in accordance with Paragraph C2.2.7,B,3,C above.
- p. When noted on the drawings, specific structures whose footings are located less than four feet below original grade shall have compacted embankment placed beneath their footings to a minimum depth of four feet below the original in situ grade. In no case where structures are placed on in situ surface sands shall less than one foot of compacted embankment be provided beneath the foundations.
- q. Lean concrete mudmats may be placed beneath Category 2 piping in non-Category 1 backfill areas to a limit of three feet horizontally beyond the outside edge of a pipe or a bank of pipes and to a maximum thickness of 6 inches. A bank of pipes shall be two or more parallel pipes placed in a common trench whose spacing does not exceed 2 feet. Mudmats shall not be placed on the sloping sides of trenches. Care shall be taken not to place concrete on or around in-place pipes. Mudmats shall be sloped to provide adequate drainage.

C. POWER BLOCK COMPACTED BACKFILL (CATEGORY 1 BACKFILL)

- 1. The contract item power block compacted backfill includes all the backfill in the power block area. Backfill material in accordance with Paragraph C2.2.6,H,3 shall be placed in layers not exceeding 6 inches in thickness before compaction. Unless otherwise shown or specified Category 1 backfill shall be compacted to an average of 97 percent of the maximum dry density determined in accordance with ASTM D 1557 with not more than 10 percent of tests below 95 percent and no test below 93 percent. Category 1 backfill to be placed in the power block excavation area north of the turbine building and above elevation 185.5 shall be compacted to an average of 95 percent of the maximum dry density determined in accordance with ASTM D 1557 with not more than 10 percent of the tests between 95 and 93 percent and no test below 93 percent. Field density shall be determined by

ASTM D 1556. The materials shall be conditioned to have a moisture content at the time of compaction in accordance with Paragraph C2.2.7, C10 such that the specified compaction may be obtained. The quality of Category I backfill shall be monitored by performing a minimum of one field density test for every 20,000 square feet of fill placed per foot depth. Areas less than 20,000 square feet which are compacted separately from adjacent material shall be monitored by performing a minimum of one field density test per foot depth. Areas compacted by vibratory compactors or other approved hand operated power tampers (C2.27, C, 5) shall be monitored by performing a minimum of one field density test for every 2000 square feet of fill placed per foot depth. Areas less than 2,000 square feet which are compacted by hand compactors separately from adjacent material shall be monitored by performing a minimum of one field density test per foot depth of fill placed. The average compaction shall be evaluated for sets of up to twenty field density tests made after placement in any area in which fill is placed. In the area requiring 97 percent compaction, the average compaction of up to twenty field density tests need not be determined if no test in the set falls below 97 percent. In the area requiring 95 percent compaction, the average compaction of up to twenty field density tests need not be determined if no test in the set falls below 95 percent. An area in which fill is placed shall be any contiguously placed area whose maximum depth is one foot and whose maximum area is 400,000 square feet. In situ field density determinations for Category I backfill shall be made in accordance with ASTM D 1556 using a 12-inch sand cone. All tests shall be made at a depth of 12 inches below the fill surface and the test hole shall have a volume of at least 0.2 cubic feet. Construction equipment must be stopped during the time the sand is being poured into the hole so as to prevent its densification by vibration. During the initial stages of Category I backfilling (about 2 weeks), one compaction test must be made for every field density test in accordance with ASTM D 1557, using a 4-inch diameter mold. Thereafter, provided satisfactory performance has been achieved in the initial phase, a minimum of one laboratory compaction (ASTM D 1557) test shall be made for each 5250 cubic yards of fill placed or one laboratory compaction (ASTM D 1557) test per day, whichever is the greater number. Also, a minimum of one test in accordance with ASTM D 1140 shall be performed for every 5250 cubic yards and a minimum of one test in accordance with ASTM D 422 (Section 5) shall be performed for every 26,250 cubic yards of fill placed and compacted.

2. The Contractor shall exercise extreme care in placing and compacting backfill in the proximity of all structures. Where backfill is placed over or against concrete structures or pipes, the fill operation shall not commence until

approval for backfilling is obtained from GPC Field Engineering. Heavy construction equipment shall not pass over any structure or pipe until such structures and/or pipes are covered by the applicable minimum depth of fill shown on the drawings or as specified.

3. During backfill compaction heavy construction equipment shall not be used within a distance of 2 feet from any concrete structures or walls. The compaction of backfill adjacent to concrete structures or walls within a distance of 2 feet and in other restricted areas shall be done using hand-operated vibratory compactors and/or power tampers.
4. Hand-operated vibratory compactors and power tampers for use adjacent to structures or walls and in restricted areas shall be subject to approval as to types and sizes. The Contractor shall, at his expense, demonstrate that the equipment will compact the material to a density at least equal to that specified. The adequacy of hand-operated vibratory compactors and power tampers shall be determined by the Engineer.
5. In areas which cannot be reached by the vibratory roller, the material shall be placed in thin lifts not exceeding 4 inches in thickness and compacted by vibratory hand compactors or power tampers unless otherwise specified herein. These hand compactors shall be approved by Engineering and shall be of a large size, capable of delivering impulses of about 1 ton or more per square foot at a frequency of 3000 to 5000 impulses per minute.

a. Backfilling buried piping and similar conduits

(1) Wooden Tamper Method

The wooden tamper method is acceptable for both safety related and non-safety related buried piping and similar conduits. The following procedure shall be followed:

- (a) Lean concrete mudmats may be placed beneath piping to a limit of three feet horizontally beyond the outside edge of a pipe or a bank of pipes and to a maximum thickness beneath the pipe of 18 inches. Concrete shall provide continuous support along the bottom of the pipe but shall not be placed more than 1/2 inch above the bottom of the pipe. A bank of pipes shall be two or more parallel pipes placed in a common trench whose spacing does not exceed 2 feet.

- (b) The backfill material may be compacted in 4 inch maximum loose lifts by use of suitably sized hand held wooden tampers. This backfill material shall contain less than 10 percent fines. The backfill material shall be compacted by tamping to the satisfaction of GPC Field Quality Control. A minimum of 4 tamps shall be applied to the entire area of each lift. After Category 1 backfill has been placed to a minimum of one lift above the tops of the ducts or pipes backfilling with Category 1 material shall continue with hand operated vibratory compactors and power tampers to a minimum depth of cover of 3 feet at which point vibratory rollers and other heavy equipment may be used. Care shall be taken to avoid damage to the pipe and its coatings through the use of wooden tampers and hand operated vibratory compactors and power tampers.
- (c) In areas between pipes where compaction is performed by wooden tamper and constrained access prevents use of the sand cone test, a minimum of 4 static cone penetrometer tests shall be performed per 100 linear feet or 200 square feet per lift of pipe trench. Testing may be performed after an additional lift has been placed with the cone penetrating a maximum of 3 inches from the surface of the backfill into the lift being tested. Readings shall be obtained using a 1/2 square inch cross sectional area steel cone. Penetrometer readings representing acceptable compaction shall be obtained by correlating penetrometer readings with sand cone tests taken in the backfill material being used. Reference Paragraph C2.2.7,C,15,f. Material represented by a test below the calibrated reading shall be removed and or reworked and retested. In addition, one sand cone test in accordance with ASTM D 1556 shall be performed for every 200 linear feet or 2000 square feet per foot of depth of trench placed by this method. An area adjacent to piping shall be backfilled by this method of sufficient area and depth for performance of the sand cone test.
- (d) Bolts attaching pipes to frames used for welding shall be cut free prior to completion of backfilling of safety-related piping.

(2) Internal Vibration Method

Non-safety related piping or similar conduits may be backfilled in Category 1 and Category 2 backfill areas by the internal vibration method within the limits of three feet above, one foot below and 3 feet horizontally beyond the outside edge of a pipe or a bank of pipes. A bank of pipes shall be two or more parallel pipes placed in a common trench whose spacing does not exceed 2 feet. Concrete sand within the following gradation shall be used for compaction around congested non-safety related piping and similar conduits:

<u>U.S. Sieve Sizes</u>	<u>Percent Passing by Weight</u>
3/8"	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-15

The following procedure shall be followed:

- (a) The sand shall be placed in the trench in loose lifts not exceeding 12 inches. The surface of the sand placed shall be reasonably level prior to moisture conditioning and compaction. This may be achieved by means of rakes and/or shovels.
- (b) After placement, the sand shall be simultaneously saturated and internally vibrated to achieve densification.
- (c) Saturation shall be achieved by providing removable barriers such as sand bags, forms, or any other acceptable material at both ends of the trench so as to prevent rapid drainage of water. Water pressure shall be controlled during saturation to reduce displacement of sand particles and disturbance in compacted areas. Sand bags, forms, etc. shall be removed subsequent to completion of the section for which they were used.
- (d) The sand shall be internally vibrated using concrete vibrators. The vibrating frequency of the vibrator in sand shall be in the range of 7,000-11,000 cycles per minute. The

11

vibrator shall penetrate to the full depth of the loose lift. Vibration of the fill shall commence after the moisture is at a state such that the vibrator will move the material to achieve densification.

- (e) Vibration shall be done uniformly along the entire surface of the loose lift. Vibration shall be performed by simultaneously working two or more vibrators on each side of the piping, resulting in a team of four men moving uniformly along the length of the bank of pipes from one end to the other. Less than four vibrators shall be used only in areas where restricted working conditions prevent the use of four or more vibrators. Care shall be taken that all areas are vibrated and that vibration takes place beneath and between pipes wherever possible and without damage to the pipes and their coatings. Special care shall be taken to avoid damage to pipe coatings from concrete vibrators. Each 150 square feet of surface area shall be vibrated a minimum of 10 minutes. A longer period of vibration may be required if visual observation shows that inadequate compaction has been achieved.
- (f) After the first lift of fill has been placed and compacted, successive lifts of fill shall be placed and compacted in a similar manner.
- (g) No testing shall be performed until the backfilled trench has drained of all standing water. To aid drainage, removable perforated pipes wrapped in Mirafi 140 filter cloth or equivalent may be used. These pipes shall be capped on the trench side of the pipe so as to prevent flow of sand backfill. The diameter and number of perforated pipe will depend on the length of trench to be backfilled. Perforated pipes may be removed subsequent to completion of the section for which they were used. Those pipes not removed shall be grouted such that no voids remain in the pipes.
- (h) Sand cone density tests shall be performed in accordance with ASTM D 1556. At least one test for every foot of elevation shall be made for every 200 linear feet, but not more than 2000 square feet of trench backfilled. Sand cone density tests may be performed using

11

a 6 inch sand cone. The use of a nuclear device will not be permitted. A minimum of four static cone penetrometer tests shall be performed per 100 linear feet or 200 square feet of pipe trench per foot of depth below and between the pipes. Testing may be performed after an additional lift has been placed with the cone penetrating a maximum of 3 inches from the surface of the backfill into the lift being tested. A reading of 200 or above shall be considered acceptable. Material represented by a test below 200 shall be removed and/or reworked and retested. The reading of 200 on the static cone penetrometer shall be attained using a 1/2 square inch cross sectional area steel cone.

11

- (i) The concrete sand shall be compacted to an average of 95 percent of the maximum dry density with not more than 10 percent of the tests between 95 and 93 percent and no test below 93 percent in Category 1 backfill areas around both Category 1 and Category 2 piping. This compaction criteria pertains specifically to the internal vibration method.

- (3) Compaction of trench backfill by ponding and jetting shall not be permitted.

- 6. The Contractor shall perform all the work associated with the compaction of power block backfill in accordance with the placement and compaction procedures specified herein or as directed by the Owner or his representative.
- 7. A Bechtel Soils Engineer may be present during backfilling operations who will witness and follow the job and assist in resolving any field problems that may arise during construction. The Owner or his representative shall be responsible for doing the necessary quality control testing to insure that the power block backfill as constructed conforms to the requirements of the specification. Any deviations from the provisions of the specification shall require approval of Bechtel.
- 8. Temporary construction lines (bulk gas etc.) 6 inches or less in diameter may be abandoned in the power block backfill area when filled as specified. Such lines shall be filled with grout by pumping grout in the lower end of the line until grout emerges at the upper end. The exact location and size of all abandoned lines shall be noted and provided to engineering. Abandoned construction lines shall be kept to a minimum. Temporary construction lines greater than 6 inches in diameter shall be removed.

9. Graded aggregate in accordance with Georgia Department of Transportation Specification, Section 8.15 (1977) may be placed within 10 feet of power block excavation slopes where required to begin compaction on saturated in-situ soils.
10. Placement
 - a. Structural backfill shall be placed in horizontal layers not exceeding 6 inches in uncompacted thickness in the powerblock area as shown. The moisture content shall be as required by Paragraph 10 below. No backfilling against concrete walls shall be done until the concrete has attained a strength equal to 70 percent of the design strength. No backfilling against base slabs shall be done until the specified curing time has elapsed, except as follows: if waterproofing has been qualified as a curing agent in accordance with ASTM C 309, backfilling against base slabs may proceed upon curing of waterproofing. If the subgrade concrete has been waterproofed, the backfilling shall be done so as not to damage the waterproofing or its protective materials. If, as determined by the Owner, the top or contact surfaces of the previous fill layer have become too dry to permit a suitable bond between those surfaces and the fill to be placed thereon, such surfaces shall be scarified, the loosened material dampened to the required moisture content and then compacted to the density of the underlying material. Before placing additional fill, material which is soft and yielding as a result of excessive water shall be either replaced with suitable material, or scarified and allowed to dry out to the specified moisture content and recompact. Such removal, replacement, recompaction and delays resulting from such operations shall be at the expense of the Contractor. Oversize material shall be removed from the backfill and disposed of in designated waste areas.
 - b. The Contractor shall keep the top of backfill properly drained at all times during construction. If the Contractor stops work on any portion of the backfill on account of rain or impending rain, the surface shall be graded to facilitate drainage. Before the work is resumed in the area, the surface shall be scarified to a depth of not less than 6 inches, moisture conditioned and recompact to the specified density.

- c. The Contractor shall take effective measures to control the surface runoff and seepage in the backfilling area as required. These measures shall include but shall not be limited to drainage, collection and disposal of surface runoff and dewatering of backfilling areas in order to accomplish the work in conformance with the specifications.
- d. During placement and compaction of Category I backfill by heavy vibratory roller the water table at any point shall be kept at least 4 feet, measured to the nearest foot, below the surface of the material being placed or compacted. During placement and compaction of Category I backfill in restricted areas by hand-operated vibratory compactors or power tampers the water table at any point shall be kept at least 2 feet, measured to the nearest foot, below the surface of the fill being placed or compacted. Even if the above conditions are met, backfill operations shall be stopped if it is determined by Field Engineering that satisfactory compaction cannot be achieved with the existing water table elevation and backfilling shall not be resumed until the ground water condition is corrected.
- e. No material shall be placed upon a frozen surface nor shall any snow, ice or frozen earth be incorporated in the backfill. Unless approved, placement operations shall be suspended when the ambient temperature is 32 F or below.

11. Moisture Control

Materials shall be moisture conditioned as far as practicable in the stockpile and borrow areas and, where necessary, on the fill just prior to compaction. If the material does not have the required moisture content, such material shall be conditioned by flooding, sprinkling, aerating, harrowing, discing, draining or other approved means. The average optimum moisture content of fill materials shall be determined based on not less than 20 ASTM D 1557 tests performed on representative samples of the fill materials prior to placing in the power block. If stockpiled materials are used, the average optimum moisture content can be determined based either on previous test data or new test data. If fill materials are obtained directly from new borrow excavations, the average optimum moisture content shall be determined from not less than 20 ASTM D 1557 tests performed on representative soil samples taken from the borrow area prior to hauling the materials for backfilling. During the progress of backfilling work the

average optimum moisture content shall be periodically updated as more data become available to account for possible variations in the fill quality either in stockpiles or in borrow excavations. The moisture content of Category I backfill at the time of compaction shall be within minus 3 percentage points and plus 2 percentage points of the average optimum moisture content of the fill materials determined in accordance with ASTM D 1557. The moisture content of the material at the time of compaction shall be determined by ASTM D 2216 or by any approved rapid procedure method that has been correlated with ASTM D 2216. After placement of loose material in the backfill, the moisture content shall be adjusted as necessary to bring the material within the required moisture content limits. Material placed in the backfill too wet for compaction shall be left to drain, to be aerated and dried by discing and harrowing or other approved means until the moisture content of the entire layer is uniform and within the required limits. Material placed in the backfill too dry for suitable compaction shall be moistened by sprinkling with water. Sprinkling shall be by sprinkler trucks equipped with pressure spray bars and valves to give a uniform and even application of water to the dry areas or by positive control of the rate of water application at all times, or by other means approved by the Owner in areas too restricted in which to operate a water truck. The layer shall then be disced, harrowed or otherwise mixed until the moisture content of the entire layer is uniform and within the specified limits. Any section of backfill containing material which is too wet or too dry shall not be compacted until the moisture content of the material is brought within the specified limits, or the material shall be removed and replaced with material having a moisture content within the specified limits. Such removal and replacement and any delays resulting from such operations shall be by and at the expense of the Contractor.

12. Procedure For Correcting Nonconformance of Category I Backfill

- a. When a field density test is carried out which indicates that the compaction criteria will not be met, the following action shall be taken:
 1. Delineate the 20,000 square foot area, 1 foot deep represented by the low test.
 2. Stop all further filling in the delineated area.
 3. Remove all fill to the top of the lift in which the low test is located and harrow and moisture condition the lift in question as necessary to meet the requirements of Paragraph C2.2.7,C.

4. Roll the area with the specified roller, number of passes, and roller speed developed in the approved test fill program, Paragraph C2.2.7,C,14,e,3.
5. Replace the fill up to grade using the specified procedures developed in the approved test fills, Paragraph C2.2.7,C,14,e,3.
6. Re-test the reworked lift making sure a laboratory compaction test ASTM D 1557 is made on material obtained adjacent to the field density test, ASTM D 1556 modified to require the use of a 12-inch sand cone.

13. Acceptable Foundation of Backfilled Sand and Silty Sand for Category I Structure Foundation Concrete or Protective Mudmat

Just prior to placement of mudmat of foundation concrete the surface of the fill shall be sprinkled and disced or harrowed to obtain a moisture content in the fill in the range specified. The surface of the fill shall then be compacted with 4 passes of a heavy smooth drum, vibratory roller or with vibratory or other approved hand operated power tampers. The above criteria shall apply to areas where the discing and harrowing operations specified can be satisfactorily performed. In restricted areas where discing or harrowing is not practical the Owner will accept for his approval on a case by case basis field methods that will assure unacceptable material has been removed and sound backfill has been encountered at or near the required grade. After acceptance of the foundation backfill by the Owner, no vehicle or equipment shall be permitted on the foundation without the Owner's approval. Adequate precautions shall be taken to prevent surface erosion or other disturbance of completed backfill prior to placement of the mudmat or foundation concrete.

14. Methods for Evaluating Disturbed Areas

Areas in compacted Category I backfill which are disturbed by erosion from storm runoff etc. shall be evaluated in accordance with the following tests and procedures.

a. Procedure for Proving Ring Penetrometer Testing

1. Proving ring penetrometer tests shall be performed at specified locations to determine the depths of the disturbed zone in the backfill.
2. The tests shall be performed at depth intervals of 6 inches as required to reach competent materials.

3. Tests shall be performed perpendicular to the surface. The penetrometer shall be firmly pushed into the soil at a uniform rate until the top of the penetration cone is reached at which point the proving ring dial shall be read.
 4. If the reading indicates a disturbed zone, the testing shall be continued to greater depths. This will be done either by carefully excavating a 2-foot by 2-foot, 6-inch deep hole or by advancing a 6-inch diameter auger hole as directed by the Bechtel Engineer and repeating step 3.
 5. Testing shall continue at 6-inch depth intervals in this manner until competent material is reached. At this point the penetrometer shall be moved to another specified test location.
 6. The field testing and evaluation shall be monitored by a Bechtel Engineer.
 7. An accurate documentation of all testing and evaluation shall be maintained. Documentation shall include penetrometer dial reading, coordinates and elevation of ground surface at test location, number and elevation of tests, date test was performed, and other pertinent data.
 8. The proving ring penetrometer shall be used only for a qualitative evaluation of the depth of disturbed zone to assist field personnel. It shall not be used as a final control test to confirm fill quality. Final control testing shall be done using the sand cone method (ASTM D 1556) in accordance with Paragraph C2.2.7,C,1 of this specification.
- b. Procedure for Dynamic Cone Penetrometer Testing
1. Penetrometer tests shall be performed in 4 to 6 inches in diameter auger holes drilled at specified locations to a maximum depth of 4 feet. Tests shall be performed at intervals of 1-foot as follows:
 - a. Hand auger to a depth of 1-foot. Identify the soil from the auger cuttings.
 - b. Seat the cone at least 2 inches to the bottom of the hole. Drive the cone point 1-3/4 inches into the hole by means of a 15-pound steel ring weight dropping a height of 20 inches.

- c. Record the number of blows required to drive the cone point 1-3/4 inches into the hole.
 - d. Auger to depth of 2 feet. Repeat the same testing procedure and record the number of blows.
 - e. Continue the testing at 1-foot intervals down to 4 feet.
- 2. The field testing and evaluation shall be monitored by a Bechtel Engineer.
- 3. Prior to testing, the dynamic cone penetrometer shall be calibrated against the Standard Penetration Test (SPT) for Category I backfill materials. To do this, a SPT boring shall be made in undisturbed Category I backfill and Standard Penetration Tests shall be made continuously from the surface down to 6 feet. Adjacent to the borings dynamic cone penetration tests will be made at 6-inch intervals in at least two auger holes to depths of at least 4 feet. A correlation will then be made between the cone penetration resistance and the SPT. The actual number of correlation tests that will be required shall be determined by the Bechtel Engineer.
- 4. An accurate documentation of all testing and evaluation shall be maintained. Documentation shall include blow count at each interval, coordinates and elevation of ground surface at test location, number and elevation of tests, date test was performed and other pertinent data.
- c. Method for Abandoning Exploratory Borings Augered in Category I Backfill
 - 1. Exploratory Borings augered for dynamic cone penetrometer testing, proving ring penetrometer testing and Shelby tube sample securing in Category I backfill shall be abandoned in accordance with the following:
 - a. On completion of the last test or sample taken in the auger hole, auger to a depth of 4 inches below the deepest advancement of the auger.
 - b. Lower a tremie pipe to the bottom of the hole and pump a grout mix of one part cement to one part water into the hole at the bottom.

- c. Continue pumping grout until surface returns are obtained. Continue pumping so as to maintain the level of grout at the top of the hole.
 - d. Place additional grout in the hole at the surface if the level of grout declines before setting.
 - e. This procedure shall be varied only if directed by the Bechtel Soils Engineer.
- 2. The augered holes shall be filled with grout immediately after completion of boring except as follows. If grout is not immediately available the hole shall be temporarily filled with sand to prevent sloughing. When grout is made available the hole shall be reaugered to its furthest previous advancement and backfilled with grout.
 - 3. Abandonment of exploratory borings shall be documented and the information provided to engineering. Documentation shall include the volume of grout used, the depth, number, coordinates and ground surface elevation of the grouted hole, the date the grouting was completed and other pertinent data. The Contractor shall assist the Owner in obtaining all such information as required.
15. Test Embankment in Power Block Compacted Backfill

a. General

- 1. The objective of the test fill operation is to determine suitable compaction equipment and procedures to obtain Category I structural backfill that meets the specified compaction criteria. The purpose of the test fills will be to demonstrate that the roller type, moisture conditioning, number of passes, and lift thickness used will obtain the required compaction.
- 2. Specifically, the test fill program will be used:
 - (a) To evaluate whether the specified compaction criteria can be met with the Contractor's proposed equipment and procedures.
 - (b) To permit the Contractor to modify his compaction equipment and procedures as necessary to meet the compaction criteria.

b. Construction of Test Fills

1. Preparation of Test Areas

- (a) It is desirable to construct the test fills on the marl foundation. However, if the construction schedule does not permit this, they can be constructed away from the excavation area provided the foundation soils are compacted.
- (b) If the test fills are made in the power block excavation, the area selected should be approved as to the acceptability of the foundation material. All low spots or depressions on the surface shall be filled in layers with the specified fill material, moisture conditioned and compacted to 97 percent of the maximum density determined by ASTM D 1557, to create a level surface.
- (c) If the test fills are made away from the excavation area, the area selected should be cleared and grubbed. The surface should be scarified to a depth of at least 12 inches and compacted to 97 percent of the maximum density determined by ASTM D 1557.
- (d) Any low spots or depressions should be filled in layers with the specified fill material, moisture conditioned and compacted to 97 percent of the maximum density determined by ASTM D 1557, to obtain a uniform foundation surface.
- (e) Test areas shall be sloped, if required to permit drainage; however, the foundation surface shall not have a gradient in excess of one percent.
- (f) The Owner or his representative shall verify the acceptability of the foundation surface beneath the test fills.

2. Materials

- (a) All materials used in the test fills shall consist of sand and silty sand from designated stockpiles and other approved borrow sources and shall meet the requirements of Paragraph C2.2.6.H3. For test fill construction, use of materials other than sand and silty sand or from sources other than those designated shall require prior approval

of the Engineer. With the approval of the Project Engineer, an additional test fill may be constructed of clayey sand from an approved source to establish the compaction procedures applicable to such material and to evaluate its suitability for area fill. However, silty sand and clayey sand should not be mixed in the test fill.

- (b) The materials used in test fills shall be classified in accordance with ASTM D 2487.

3. Test Fills

- (a) Each test fill shall be at least 150 feet x 100 feet in plan, with side slopes of 2:1 (H:V). The height of test fills should be at least 5 feet. The test fill shall include access ramps at both ends of the embankment. Each test fill shall be divided into three or four equal sections. Each section shall be raised according to the designated sequence of lifts and lift thicknesses, and compacted with designated equipment by the specified number of passes in accordance with Paragraph (b) below.
- (b) A test fill shall be constructed for each of the types of compaction equipment used. For the compaction equipment described in Paragraph C2.2.7,C,14,c test fills shall be constructed in accordance with the procedure in Table 1. For equipment differing from that described in Paragraph C2.2.7,C,14,c the number of roller passes specified in Table 1 may be modified with the approval of the Engineer.
- (c) The moisture content of fill material shall be within ± 2 percentage points of the optimum moisture content determined by ASTM D 1557. Material too wet or too dry shall not be compacted until brought within the required limits.
- (d) A roller pass shall consist of one complete coverage of the section by the specified roller. In order to assure complete coverage of the section, each trip of the roller shall overlap the adjacent trip by not less than 2 feet.

- (e) All test fill material shall be placed with equipment travelling parallel to the centerline of the test fill embankment. The entire surface of the test fill shall be maintained in such condition that construction equipment can travel on any part of the test fill. Before compacting, ruts in the surface of any lift shall be leveled. The fill shall be raised uniformly in a horizontal plane and the fill surface shall be sloped to drain.

TABLE 1
TYPICAL TEST FILL PROCEDURES

ROLLER TYPE	CONSTRUCTION SEQUENCE	NUMBER OF LIFTS	UNCOMPACTED THICKNESS OF EACH LIFT (IN)	NUMBER OF ROLLER PASSES FOR EACH LIFT			
				SECTION NO.			
				1	2	3	4
Rubber Tired	1	4	6	4	6	8*	12*
	2	3	9	4	6	8*	12*
	3	2	12	4	6	8*	12*
Vibratory	1	4	6	4	6	8*	
Smooth Drum	2	4	9	4	6	8*	

*If the specified compaction is achieved in 4 or 6 passes, testing of 8 and 12 passes may be deleted, provided this is approved by Bechtel Soils Engineer.

c. Equipment

1. The following compaction equipment will be acceptable for the test fill construction:
 - (a) A 50-ton rubber tired roller with tire pressure maintained at 90 psi or higher. The tire pressure is important as it may have to be increased to obtain the desired degree of compaction. Facilities must be available to determine tire pressures and to change tire pressures if required.

(b) A smooth drum vibratory roller having a minimum dead weight of 10 tons and the ability to vary the vibrations in the range of 1100 to 1700 rpm. The RAYGO, Model 600 A and Dynapac, Model CA 25 vibratory rollers are acceptable for the test fill construction.

2. Compaction equipment used in the test fill operation shall be the same type and size to be used for the installation of Category I backfill. Only equipment that can be shown to meet specification requirements shall be used in the plant fill. The compaction equipment shall either be self-propelled, or the equipment used to pull the rollers shall have sufficient power to operate the rollers when they are ballasted to the specified weights.
3. The compaction equipment to be used in the test fill program should meet the requirements described in Table 2. The addition of equipment which does not meet these requirements shall be subject to the approval of the Engineer and demonstrated ability of equipment to meet the required compaction criteria. Corresponding modifications of the procedures in Table 1 to include additional equipment shall be made in accordance with Paragraph C2.2.7,C,14,b,3,(b).
4. For each type of compaction equipment, the testing should be done by varying the lift thickness and the number of passes as indicated in Table 1.

d. Field and Laboratory Testing

1. After four lifts have been placed in any test fill, testing shall be carried out after each successive lift is placed and compacted. The in situ density should be determined by ASTM D 1556 method. The in situ density tests should be done at least at six locations per section per lift. The test shall be done at a minimum depth of 12 inches to avoid any disturbance in the upper layers of the fill.
2. Compaction tests shall be made on material obtained from each field density test location using ASTM D 1557 procedure. In addition, for material at each test location the gradation shall be determined in accordance with ASTM D 422, liquid and plastic limit tests shall, if applicable to the soils tested, be determined in accordance with ASTM D 423 and D 424 respectively.

TABLE 2
EQUIPMENT CRITERIA

Rubber-Tired Roller

The rubber-tired roller shall have a minimum of four wheels equipped with pneumatic tires which shall be of such size and ply that the tire pressure can be maintained between 90 and 100 psi for a 30,000 pound wheel load during rolling operations. The roller wheels shall be located abreast in a rigid steel frame, each wheel loaded by an individual weight box so that each will carry an equal load when traversing uneven ground. The spacing of the wheels shall be such that the distance between the nearest edges of adjacent tires will not be greater than 50 percent of a single tire width when the tire is at the operating pressure and is subjected to a 30,000 pound load. The weight boxes shall be suitable for ballast loading such that the load per wheel may be varied as required from 18,000 to 30,000 pounds. The roller shall be towed at speeds not exceeding 10 miles per hour.

Smooth Drum Vibratory Roller

The smooth drum roller shall be a self-propelled vibratory type. The roller shall have a static weight of at least 20,000 pounds and be capable of applying a dynamic force of not less than 40,000 pounds at 1400 rpm. The roller should have the capability to vary the vibration frequencies in the range of 1100 to 1700 rpm. The rollers shall be operated at a speed not exceeding two miles per hour.

3. Other methods of field density determination such as nuclear device (ASTM D 2922) or rubber-balloon method (ASTM D 2167) may be used for correlation purposes provided these tests are done in addition to the procedure described in Paragraph 1 above. If a nuclear device is used, it shall be calibrated every day.

e. Inspection and Evaluation

1. The test fills shall be inspected by a Bechtel Soils Engineer throughout their construction. A complete record shall be kept of equipment, materials, construction procedures, and testing.
2. Upon completion of the test fills and soil testing, the Bechtel Soils Engineer will evaluate the data and prepare a report including recommendations for the compaction equipment and procedures to be followed to meet the specified compaction criteria for the Category I structural backfill.
3. Procedures and equipment established as acceptable for achieving the requirements specified in Paragraph C2.2.7.C1 are given below:

f. Test fill for correlation between penetrometer and percent of maximum dry density determined in accordance with ASTM D 1557 for Category 1 backfill.

1. Correlation between penetrometer readings and percent of dry density determined in accordance with ASTM D 1557 for Category 1 backfill material shall be obtained for each of the following:

0-4 percent fines
4-7 percent fines
7-10 percent fines

2. A test fill section with areas of variable compaction shall be established for purposes of developing this correlation.
3. At least 5 field density tests in accordance with ASTM D 1556 shall be performed for each range of fines. At least two tests shall result in compaction between 90 and 97 percent and at least two tests shall result in compaction above 97 percent. Sand cone tests shall be performed at the surface for the purpose of this correlation. At least 10 penetrometer readings shall be made in the

immediate vicinity of each sand cone test with a maximum 3 inch cone penetration below the surface. The penetrometer readings representing each sand cone test shall be averaged and plotted versus the percent of dry density resulting from that sand cone test. The resulting curve shall be used to determine the penetrometer reading which represents 97 percent compaction. Penetrometer readings in Category 1 backfill which are at or above the calibrated reading shall represent acceptable compaction for Category 1 backfill in areas between pipes or similar conduits where constrained access prevents use of the sand cone test (ASTM D 1556). All data and results shall be provided to Engineering for approval.

11

SUMMARY OF TEST FILL PROCEDURES MEETING CATEGORY I BACKFILL

COMPACTION CRITERIA

<u>Material</u>	<u>Compaction Equipment</u>	<u>Loose Lift</u>	
		<u>Number of Passes</u>	<u>Thickness (Inch)</u>
Sand and Silty Sand from Qualified Borrow Sources	Ingersoll Rand SPF 60 and SP 60 or Raygo 600A	2 each*	6
Sand and Silty Sand from Qualified Borrow Sources	Ingersoll Rand SP 60 or Raygo 600A	4	6

*The fill surface is to be leveled with a grader after each pass of the SPF 60.

D. AREA FILL EMBANKMENT

1. Surfaces or original ground are to be constructed shall have a minimum depth of 6 inches.
2. The embankment may be constructed with excavating and hauling equipment or by excavating equipment which deposits the materials directly upon the embankment from excavation in lifts of 12 to 24 inches. When embankments are built by mechanical excavating and hauling equipment, travel shall be routed over the embankments during construction so as to distribute the compacting effect of the equipment to the best advantage. When embankments are built by excavating equipment which deposits the material directly upon the embankment from the excavation, the material shall be spread and leveled in layers not exceeding 2 feet in thickness with no compaction required.

3. Fill constructed for the purpose of improving drainage conditions shall be constructed as specified herein for area fill. Finish surface shall be leveled and sloped to drain.

E. EMBANKMENT ADJACENT TO SLOPES

Where embankments are placed against earth slope or adjacent to an existing embankment, any vegetation shall be removed and the surface shall be plowed or stepped with furrows 12 inches deep measured normal to the adjacent ground surface, before placing any fill material. Such plowed material shall be spread on adjacent new fill and compacted and rolled. No payment will be made for this slope preparation and plowing.

F. WASTE EMBANKMENT

Waste embankments shall be placed in the spoil areas to the lines and elevations shown on the drawings or as directed by the Owner. Waste embankments shall be constructed in lifts not to exceed 2 feet in thickness. The travel of excavating and hauling equipment shall be routed over the embankment so as to distribute the compacting effect of the equipment in a manner considered by the Owner to be most advantageous. No further compaction or any moisture conditioning of the material will be required unless directed by the Owner. The top of the completed embankment shall be reasonably flat and approximately parallel to the slope of the terrain or as directed by the Owner.

G. WATERING

1. Water will be furnished at the site at no charge to the Contractor. The Contractor shall furnish, install, operate and maintain all on-site storage and pumping facilities that the work may require as specified herein.
2. Watering shall include, but not be limited to, applying water during construction of embankment, subgrade preparation and for dust control during grading operations.

H. FINISHED EXCAVATION, FILLS AND EMBANKMENTS

1. All areas covered by the project, including excavated and filled sections and adjacent transition areas, shall be uniformly smooth graded. The finished surface shall be reasonably smooth, compacted and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from either blade grader or scraper operations, except as otherwise specified. The finished subgrade surface shall not be more than 0.2 foot above or below the established grade or approved cross section.

2. Ditches shall be finished so as to permit adequate drainage. The surface of embankments or excavated areas for road construction or other areas to be paved on which a base course or pavement is to be placed shall not vary more than 0.10 foot from the established grade and approved cross section.

C2.2.8 EROSION CONTROL

A. GENERAL

1. This work shall consist of performing erosion control during construction of cut and fill slopes including but not limited to stockpile slopes, roadway slopes, railroad right of ways, Power Block excavations and shall include slope preparation, fertility soil tests by an approved Agricultural Soil Testing Agency, applying temporary soil binders, seeding and fertilization on areas as designated by the Owner, as shown on the plans and as specified herein.
2. The method to be employed for erosion control at particular areas shall be specified and directed by the Owner.
3. The Contractor shall develop the site in stages and shall perform all clearing, grading and stabilization operations in a specified area before moving to another area in order to minimize the amount of land to be exposed at one time.
4. The Contractor shall start performing the erosion control as the rough grading operation reaches near completion in one area. The Contractor shall perform effective short-term stabilization practices consisting of the application of chemical soil binders and long-term stabilization practices consisting of seeding or planting the slopes. The maximum length of time that a graded area can be left uncovered after completion of grading shall be determined by the Owner.
5. The Contractor may refer to the soil and water conservation plan of the Owner for the application of seeds, fertilizers and hydroseeder slurry, etc.
6. The Contractor shall apply seeds, fertilizers, mulch, binders, hydroseeder slurry, etc. as specified herein and as directed.

B. MATERIALS

1. Chemical Soil Binders

Aerospray 52 Binder of Curasol AE, Petroset S. B. or equal shall be used for temporary stabilization. For hydroseeding the binder shall be a dry concentrate powder of 90 percent pure Mucilage derived from plantago insularis ovata.

2. Straw

Straw shall be either new straw derived from rice, wheat, oats, or barley, or racetrack stable bedding material. Unweathered, unchopped small grain straw shall be used.

3. Jute Netting and Jute Bags

Jute netting shall be heavy woven jute mesh of rugged construction and shall be constructed of undyed and unbleached twisted jute fibers. Jute bags shall be of any commercial type.

4. Seed

Seed shall be capable of establishing permanent vegetation in a short period of time. For use on stockpiles slopes, seed selection will be restricted to a low root and growth ground cover. Pensacola bahia grass, common bermuda grass seed or approved equal shall be used.

5. Commercial Fertilizer

Commercial fertilizer shall be in pelleted or granular form, shall comply with the chemical analysis as specified by the Owner and shall conform to the requirements of the Agricultural Code of the State of Georgia. N-P₂O₅-K₂O with specified proportion shall be used.

6. Topsoil

Topsoil where required shall consist of fertile, friable soil of loamy character, and shall contain an amount of organic matter normal to the region. Topsoil shall be capable of sustaining healthy plant life.

7. Wood Fibers

Wood fiber shall be derived from Hemlock, Aspen, or Alder Chips dyed green.

8. Lime

Agricultural lime suitable for application in slurry mix.

C. STABILIZATION OF SOIL SLOPES

1. General

Soil slopes include all denuded cut, fill, stockpiles or natural soil slopes. They will be constructed as specified in Paragraph C2.2.6,B in this specification. Soil stabilization shall be performed to control water and wind erosion during and after grading operations as directed by the Owner.

2. Scope of Work

The Contractor shall perform all work necessary for soil stabilization including short and long term stabilization. The Contractor shall furnish all tools, labor, equipment and supervision for the satisfactory completion of the work. This may include but is not limited to the following items:

- a. Chemical Soil Stabilization.
- b. Straw Mulch Stabilization.
- c. Jute Netting.
- d. Seeding.
- e. Sandbag Check Dams.

3. Description

a. Chemical Stabilization

The Contractor shall use chemical binders such as Aerospray 52 Binder or Curasol AE or Petroset S. B. on soil slopes from all the cuts, fills, stockpiles and disposal areas as soon as the slope is formed to retard erosion for a short time period or until conditions are more favorable for long term vegetative stabilization. Slopes that will become permanent or exposed for a long period will be seeded for permanent vegetation after the chemical stabilization. Chemical binders shall be applied in accordance with the manufacturer's recommendations or as directed by the Owner.

b. Straw Mulch Stabilization

The Contractor shall perform all work necessary to prepare areas on which straw is to be placed. The work shall conform to DOT section 164 except that the straw can be used as a mulch product on newly seeded areas and it can be applied on 2H:IV slopes.

c. Jute Netting

Jute netting shall be used in the establishment of vegetation in critical areas as designated by the Owner. The Contractor shall prepare the seedbed as specified in these specifications and as directed by the Owner. Seeding shall be split so that one half of seed is sown after the jute has been applied. Manufacturer's technical instructions shall be followed for specific guidance in laying of the thatching. The matt shall be placed by rolling on and secured by wire staples.

d. Hydroseeding

1. Seeding for permanent vegetation will be applied to the slopes by a hydroseeder slurry at the rates specified below or by another method approved by the Owner.

- (a) Stockpile slopes and pads for long term stabilization.

Pensacola Bahia grass	60 lbs per acre
Fertilizer (N-P ₂ O ₅ -K ₂ O)	90-180-180 lbs/per acre
Wood cellulose fiber mulch	2000 lbs per acre
Soil stabilizer	120 lbs per acre

- (b) Other slopes for long term stabilization.

Sericea lespedeza scarified	40 lbs per acre
Sericea lespedeza unscarified	20 lbs per acre
Weeping love grass	6 lbs per acre
Fertilizer (N-P ₂ O ₅ -K ₂ O)	90-180-180 lbs per acre
Wood cellulose fiber mulch	2000 lbs per acre
Soil stabilizer	120 lbs per acre

2. Top dressing - The lime and fertilizer is to be applied uniformly with hydraulic seeding equipment when love grass plants are about 3 inches tall.

Fertilizer	Nitrogen 50 lbs per acre
Lime	3000 lbs per acre or amount indicated by soil tests.

3. Seed shall not be mixed into the slurry until just before the start of seeding. The spray must be applied uniformly over the entire surface so that the wood fibers and seed are distributed equally without concentration or either in great or lesser

proportions. A gear pump with paddle agitation is recommended. If a centrifugal pump is used, the delivery time must be limited to 20 minutes or less (moment from placing seed in water until tank is empty). The Contractor, within one year, preferably in March or April, shall fertilize all slopes with (N-P₂O₅-K₂O) at the rate of 100 lbs per acre and reseed areas eroded by excessive rain until a good vegetative cover is established.

e. Sandbag Check Dams

Sandbag Check Dams are temporary barriers or diversions that are constructed of sandbags to retain sediment on-site and to cause deposition of sediment at the structure. The Contractor shall provide the check dams as directed by the Owner.

C2.2.9 DRAINAGE

A. GENERAL

This section covers the contract items culverts and the lined ditches at the locations shown on the plans. The Contractor shall furnish all labor and equipment and perform all operations required for placing and constructing culverts and drainage ditches as required on the design drawings.

B. CULVERTS

This work shall consist of installing corrugated metal pipe and pipe arches for culverts and drains all with necessary fittings as shown on the plans or as directed by the Owner in accordance with the provisions of this specification

1. Materials

a. Corrugated Steel Pipe and Pipe-Arch Culverts

Corrugated steel pipe and pipe-arch culverts shall conform to the sizes and gages as shown on the design drawings. Material and fabrication shall conform to AASHTO Designation M36 Type II and AASHTO Designation M190 Type A for additional coating.

b. Structural Plate Pipes and Pipe-Arch Culverts

Steel structural plate for pipe, pipe arches and arches shall conform to the sizes and gages as shown on the design drawings and shall conform to AASHTO Designation M167 and AASHTO Designation M36 Type II and AASHTO Designation M190 Type A for additional coating.

c. Coating

Bituminous coating of pipes shall conform to the provisions of AASHTO Designation M190. Galvanized corrugated steel bituminous coated pipe and pipe-arch culverts shall be used as special provision. When protective coatings are applied to pipes, each section of pipe and fittings shall have the thickness painted on the inner surface so that the thickness can be readily identified. Damaged bituminous coatings shall be repaired by the Contractor at his expense, by applying bituminous material conforming to the provisions or other approved material as directed by the Owner.

2. Placement

- a. Corrugated metal products shall be shipped and handled in such a manner as to prevent bruising, scaling or breaking of protective coating.
- b. Excavation, backfill, and shaped bedding shall conform to the provisions in Paragraph C2.2.6,E "Trenching" or as shown on the drawings.
- c. The pipes shall be laid in a trench excavated to the lines and grades established by the Engineer. The bottom of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the pipe.

3. Structures

Where shown on the plans, inlet and outlet structures shall be constructed or installed in connection with corrugated metal pipes. Where such structures are constructed or installed, the ends of pipes shall be placed flush or cut off flush with the structure face, unless otherwise directed by the Owner.

4. Stone Protection

This work shall consist of stone slope and stone structure protection for ditches, embankments and structures as shown on the drawings.

a. Materials

- (1) Stone Slope Protection. The rock material for the contract item Stone Slope Protection shall contain 50 to 60 percent by weight of rock and boulders

weighing from 75 to 120 pounds. The remainder of the material shall conform to the following gradation:

<u>Screen Size</u>	<u>Percent Passing by Weight</u>
12 inches	90-100
6 inches	60-90
3 inches	30-70
1-1/2 inches	10-30
3/4 inch	0

- (2) Rock material shall be hard, dense, durable, and free from cracks, seams, and other defects that would tend to foster deterioration from natural causes. Rock material shall have a specific gravity of not less than 2.50. The shape of rock and boulders shall be such that the minimum dimension of a rock or boulder is not less than 75 percent of the maximum dimension.
- (3) Stone Structure Protection. Rock material for the contract item Stone Structure Protection shall be reasonably well graded containing 55 to 65 percent by weight of rock or boulders weighing from 150 pounds to 200 pounds, with dimensions that vary between 6 inches and 18 inches.
- (4) Filter Material. Filter material placed under stone slope protection, stone structure protection, shall conform to the following gradation:

<u>Screen Size</u>	<u>Percent Passing by Weight</u>
3 inch	100
1-1/2 inches	85-100
3/4 inch	65-85

<u>Screen Size</u>	<u>Percent Passing by Weight</u>
3/8 inch	40-70
U.S. Sieve No. 4	10-40
U.S. Sieve No. 8	0-3

b. Placement

- (1) Stone slope protection and stone structure protection shall be placed to the lines and grades shown immediately following completion of the embankment, channel, or structure involved, unless otherwise required by the Owner's Representatives. Stone slope protection shall be placed to its full course thickness in one operation in such a manner as to be stable. The larger stones shall be evenly distributed throughout the entire mass of stones so that the rock material in its final position shall conform to the specified gradation. Surfaces of the completed protection shall be to the lines and grades shown on the drawing with a tolerance of plus 0.50 feet except that the extreme of such tolerance shall not be continuous over an area greater than 200 square feet. Stone structure protection shall be placed in such a manner that the large boulders are well distributed through the rock mass. Rock or boulders shall be placed in such a manner as to prevent damage to the concrete structures.
- (2) Filter material shall be placed under stone structure and stone slope protection in locations and to the lines and grades shown on the drawings. The subgrade upon which the filter material is to be placed shall be tamped or rolled to provide an acceptable foundation before placement of the filter material. The placing methods shall be such as to prevent segregation of the material. Filter material requiring compaction shall have a water content of 3 to 10 percent during compaction; or as required to place and compact it as specified without segregation. Filter material shall be compacted with a roller weighing not less than 50 pounds per linear inch of drum length, or by other approved means. Filter material shall be compacted to not less than 70 nor more than 90 percent of the maximum density determined in accordance with ASTM D 1557.

c. REINFORCED CONCRETE

1. This work shall consist of construction of reinforced concrete headwalls of the culverts and other structures in accordance with the details and dimensions shown on the plans, and Division C3 of this specification.
2. Portland cement shall conform to ASTM C 150, Type I or Type II.
3. Unless otherwise specified or shown concrete shall have a 3000 psi minimum ultimate compressive strength as specified in Division C3.6 of this specification.

4. Concrete temperature at time of placement shall not exceed 85 F.
5. Unless otherwise shown or specified reinforcing bars shall conform to the requirements of ASTM A 615, Grade 60.
6. Unless otherwise shown or specified surfaces shall be screeded level, tamped with a grid temper until a thin bed of grout forms on the surface and then floated with machine floats as approved by the Owner.

D. AIR-BLOWN MORTAR

1. This work shall consist of lining ditches with air-blown mortar in accordance with the details and dimensions shown on the plans, and this specification.

2. Materials

- a. Portland Cement

- (1) Portland cement for all air-blown mortar construction shall conform to the specifications of ASTM Designation: C 150, Type I or Type II.
 - (2) The cement shall be protected from exposure to moisture until used. Sacked cement shall be so piled as to permit access for tally, inspection, and identification of each shipment.

- b. Aggregate

Fine aggregate shall conform to ASTM Specification C-33, including the methods of sampling and testing.

- c. Water

Water shall be clean and free from injurious quantities of oil, acid, alkali, organic matter or other harmful impurities.

- d. Dry Mixture

- (1) The dry mixture shall consist of one part Portland cement to not more than 4-1/2 parts of fine aggregate thoroughly mixed in a dry state before being charged into the machine. Measurement may be either by volume or weight. The fine aggregate shall contain not more than 6 percent moisture by weight.

- (2) The premixed mortar shall contain not less than 6-1/2 sacks of Portland cement per cubic yard, fine aggregate and water. A maximum of 30 percent pea gravel may be substituted for fine aggregate. The maximum size of pea gravel shall be such that 100 percent passes the 1/2 inch screen and at least 90 percent passes the 3/8 inch screen.
- (3) The mix shall have a slump that is not more than 2 inches and shall remain firmly in place after application.

e. Mesh Reinforcement

- (1) Mesh reinforcement shall conform to ASTM Specification A-185.
- (2) Mesh reinforcement shall be rolled flat before placing concrete, unless otherwise shown on the plans. Mesh reinforcement shall be held firmly in place against vertical or transverse movement by means of devices satisfactory to the Owner.
- (3) Mesh reinforcement shall be lapped sufficiently to maintain uniform strength and shall be securely fastened at the ends and edges. The edge lap shall be not less than one mesh in width.

3. Preparation of Foundation

- a. The foundation for areas to receive air-blown mortar shall be evenly graded before the mortar is applied and no point on the graded slope shall be above the slope plane shown on the plans or directed by the Owner.
- b. The areas shall be thoroughly compacted, with sufficient moisture to provide a firm foundation and to prevent absorption of water from the mortar, but shall not contain free surface water.
- c. When shown on the plans, joints, side forms and shooting strips shall be provided for backing or paneling. Ground or gaging wires shall be used where necessary to establish thicknesses, surface planes and finish lines.

4. Placing

- a. The placing of premixed mortar shall be limited to 8-foot lifts measured along the slopes, and gaging wires shall be placed at approximately 7-foot centers.

- b. The nozzle shall be directed in such a manner as to result in a minimum rebound of the mortar.
- c. The velocity of the material as it leaves the nozzle shall be maintained uniform and at a rate determined for the given job conditions.
- d. A constant pressure of not less than 45 pounds per square inch shall be maintained in the placing machine where the hose length is 100 feet or less and the pressure shall be increased at least 5 psi for each additional 50 feet of hose or fraction thereof.
- e. Water used for hydration at the nozzle shall be maintained at a uniform pressure, which shall not be less than 15 pounds per square inch greater than the air pressure at the machine.
- f. Materials that have been mixed for more than 45 minutes and have not been incorporated in the work shall not be used, unless otherwise permitted by the Owner.
- g. Rebound recovered which is clean and free of foreign material may be reused as fine aggregate in quantities not to exceed 20 percent of the total fine aggregate requirements.

5. Finishing

- a. After the mortar has been placed as nearly as practicable to the required depth, the surface shall be checked with a straightedge, and any low spots or depressions shall be brought up to proper grade by placing additional mortar in such a manner that the finished surface will be reasonably smooth and uniform for the type of work involved.
- b. Loose areas of air-blown mortar shall be removed and replaced by the Contractor at his expense.
- c. Air-blown mortar shall be cured conforming to the specifications of AASHTO Designation M182 or as approved by the Owner.
- d. If a coloring agent is added and the Contractor elects to use the curing compound method for curing the air-blown mortar, the curing compound shall be the clear or translucent type conforming to the specifications of AASHTO Designation: M148, Type I, except that the loss of water in the water retention test shall not exceed 0.040-gram per square foot.

MEETING SUMMARY DISTRIBUTION

Docket No(s): 50-424/425

NRC PDR

Local PDR

NSIC

PRC System

LB #4 r/f

Attorney, OELD

E. Adensam

Project Manager J. Hopkins

Licensing Assistant M. Duncan

NRC PARTICIPANTS

J. Hopkins

J. Kane

M. Wigdor

bcc: Applicant & Service List