LIBRARY BJ

Reference
DACW09-77-B-0031

SPECIFICATIONS

for

Property of
Flood Control District of MC Library
Please Return to
2801 W. Durango
Phoenix, AZ 85009

CAVE BUTTES DAM

PHOENIX, ARIZONA

Gila River Basin,

New River and Phoenix City Streams, Arizona

Appropriation: 96x3122 Construction General
Corps of Engineers, Civil

RECEIVED
Flood Control Dist.
Maricopa County

AUG 1 1977

U S Army Engineer District
Los Angeles
Corps of Engineers

LIBRARY
CAP-S-7

Reference: DACW09-77-B-0031-0001

Bid Opening Date: 30 August 1977

U. S. ARMY ENGINEER DISTRICT, LOS ANGELES
P. O. Box 2711
Los Angeles, California 90053

10 August 1977

AMENDMENT NO. 1

I. Specifications, Reference No. DACW09-77-B-0031, covering "Cave Buttes Dam, Phoenix, Arizona," are modified as follows:

1. INVITATION FOR BIDS.

1.1 Page I-1. Delete the Bid opening date "25 August 1977" and insert: 30 August 1977

II. This amendment shall be attached to and shall become a part of the specifications.

HUGH G. ROBINSON
Colonel, Corps of Engineers
District Engineer

NOTICE: Bidders are required to acknowledge receipt of this amendment on the Bid Form, in the space provided, or by separate letter or telegram prior to opening of bids. Failure to acknowledge all amendments may cause rejection of the bid.

Necessity Verified

Reference: DACW09-77-B-0031-0002

Bid Opening Date: 30 August 1977

U. S. ARMY ENGINEER DISTRICT, LOS ANGELES
P. O. Box 2711
Los Angeles, California 90053

16 August 1977

AMENDMENT NO. 2

I. Specifications, Reference No. DACW09-77-B-0031, covering "Cave Buttes Dam, Phoenix, Arizona", and the drawings are modified as follows:

2. INVITATION FOR BIDS.

2.1 Wage Determination Decision. Following Standard Form 23 insert Modification No. 2, dated 22 July 1977, to Rates of Wages, Decision No. AZ 77-5058.

3. COVER.

3.1 Appropriation. To the Appropriation add: 96x8862 Contributed Funds, Required

4. BID FORM.

4.1 Page B-2. In the lower right-hand corner of the page, delete the entire mailing address and insert:

U. S. ARMY ENGINEER DISTRICT, LOS ANGELES
ARIZONA RESIDENT OFFICE
2721 North Central Avenue
Phoenix, Arizona 85004

4.2 Delete Pages B-3 and B-6 and insert the inclosed Page B-3 (Revised) and Page B-6 (Revised).

5. TITLE PAGE.

5.1 Appropriation. To the Appropriation add: 96x8862 Contributed Funds, Required

6. PART I, SPECIAL PROVISIONS.

6.1 Page S-1. After paragraph 1 add:

1.1 Bypass Channel. Construction of the bypass channel shall not begin until the Dam embankment has reached Elevation 1650.0.

6.2 Pages S-1 and S-2, paragraph 3.1. Insert "Revision A" after the following drawing numbers:

244/2	244/51
244/35	244/52
244/49	244/55
244/50	244/56

6.3 Page S-10.

6.3.1 Paragraph 14.2, line 2. Delete "Items Nos. 4, 9, 33, 34, and 37" and insert: Items Nos. 4, 9, 33, and 34

6.3.2 Paragraph 14.3.

6.3.2.1 Line 1. Delete "Items Nos. 4, 9, 33, 34, and 37" and insert: Items Nos. 4, 9, 33, and 34.

6.3.2.2 Line 3. Delete "Items Nos. 4, 9, 33, 34, and 37" and insert: Item No. 37

Am. 2

7. SECTION 1A, GENERAL REQUIREMENTS.

7.1 Page 1A-2, paragraph 3.2.1, line 1. Delete "Figures 1, 1A, 2, and 3" and insert: Figures 1, 2, and 3

7.2 At the end of the section delete Figure 1A.

8. SECTION 1B, MEASUREMENT AND PAYMENT.

8.1 Page 1B-1.

8.1.1 Paragraph 3.1, lines 3 and 4. Delete "stone protection * * * stripped material" and insert: stone protection and topsoiling

8.1.2 Paragraph 3.2, line 2. Delete "dam borrow areas" and insert: dam, borrow area,

8.1.3 Paragraph 4.1.1.1, lines 1 and 2. Delete "drainage and bypass channels" and insert: drainage channel, bypass channel, and outlet works channel

8.2 Page 1B-2.

8.2.1 Delete paragraphs 4.2 and 5.1 and insert:

4.2 Payment for Excavation will be made at the applicable contract prices, which payments shall constitute full compensation for excavating, hauling and disposing of the excavated materials. Excavation for access and overlook roads shall also include all costs for grading and subgrade preparation.

5. FILLS.

5.1 Measurement for fills will be made between the excavation and structure lines and the fill limit lines, or between the ground lines and fill lines, as indicated on the drawings. Quantities will be computed in cubic yards by the average end area method and the planimeter will be considered a precise instrument for measuring plotted cross sections.

8.3 Page 1B-3.

8.3.1 Paragraph 12.1, line 4. Delete "includes precast bridge * * * energy dissipator fencing" and insert: includes precast concrete bridge, grating assembly, handrail, and energy dissipator fencing. Payment will not include grouted stone slope protection for approach channel and stone protection for outlet channel for which separate payments are provided.

8.3.2 Paragraph 14.1.

8.3.2.1 Line 2. Delete "on a unit price basis" and insert: on a cubic yard basis

8.3.2.2 Line 4. Delete "theoretical batch weight" and insert: approved batch weight

9. SECTION 2A, DIVERSION AND CONTROL OF WATER.

9.1 Page 2A-1.

9.1.1 Delete paragraph 1.3 and insert:

1.3 The existing Cave Creek Dam may be utilized for diversion and control of water, including flood flows during construction of outlet works and the dam embankment. The existing dam has a capacity of approximately 12,400 acre-feet of water. The invert elevation of the dams ungated outlet is 1580.6. At full head the outlet has a capacity of approximately 500 cfs maximum.

9.1.2 Delete paragraph 1.4.2 and insert:

1.4.2 Flows From Existing Cave Creek Dam and Drainage Area Between Existing Dam and New Embankment.

Am. 2

10. SECTION 3C, EMBANKMENTS AND FOUNDATION PREPARATION.

10.1 Page 3C-1.

10.1.1 After paragraph 3.4 add:

3.5 Moisture and Gradation Testing. Tests shall be performed by the Contractor in the frequencies specified hereinafter and in such locations to insure that the specified requirements are being obtained. Test results shall be on approved forms and shall be submitted with the Contractor Quality Control Report on the work day following the test. Minimum testing frequency for gradation and moisture content shall be as follows:

Material	First 15% of Embankment	Remainder of Embankment
Zone I	1 per 2,000 Cu. Yd.	1 per 4,000 Cu. Yd.
Zone II	1 per 5,000 Cu. Yd.	1 per 10,000 Cu. Yd.
Zone III	1 per 5,000 Cu. Yd.	1 per 10,000 Cu. Yd.

10.2 Page 3C-3, paragraph 5.2.2.

10.2.1 Line 10. Delete "5 feet in height" and insert: 3 feet in height

10.2.2 Line 11. Delete "steeper than 2 vertical" and insert: steeper than 1 vertical

10.3 Page 3C-4.

10.3.1 Paragraph 8.1, line 2. Delete "in subsequent paragraphs."

10.3.2 At the end of paragraph 8.1 add: The Contractor shall provide pressure gages and weighing equipment for measurement of tire pressures and loading of the equipment. Gages and weighing equipment shall be periodically checked and calibrated for accuracy. All tests shall be made in the presence of a Government inspector in such a manner and at such intervals as may be directed.

10.3.3 After paragraph 8.1.2 add:

8.1.3 Vibratory Rollers. Vibratory rollers shall be towed and have a total static weight of not less than 20,000 pounds with at least 90% of the weight transmitted to the ground through a single smooth drum when the roller is standing in a level position hitched to the towing vehicle. The diameter of the drum shall be between 5 and 5.5 feet and the width between 6 and 7 feet. The frequency of vibration during operation shall be between 1,100 and 1,500 fpm, and the dynamic force shall be not less than 40,000 pounds at 1,400 fpm. The roller shall be towed at speeds not to exceed 1.5 miles per hour by a crawler tractor with a minimum drawbar rating of 50 horsepower. The equipment manufacturer shall furnish sufficient data, drawings, and computations for verification of the above specifications, and the character and efficiency of this equipment shall be subject to the approval of the Contracting Officer. Vibratory rollers used for compacting sand and gravel fill and filters shall conform with these requirements with the exception that they may be either towed or self-propelled.

10.3.4 Paragraph 8.2, lines 6, 7, and 8. Delete "When the moisture * * * rubber-tired roller" and insert: When the moisture content and the condition of the layer is satisfactory, the lift shall be compacted by not less than 6 complete passes of the 50-ton rubber-tired roller for Zone I, not less than 8 complete passes of the 50-ton rubber-tired roller for Zone II, and not less than 8 complete passes of the 50-Ton rubber-tired roller or the vibratory roller for Zone III.

Am. 2

II. This amendment shall be attached to and shall become a part of the specifications.

HUGH G. ROBINSON
Colonel, Corps of Engineers
District Engineer

4 Incls.

1. Rates of Wages
   Mod. No. 2
2. Page B-3 (Revised)
3. Page B-6 (Revised)
4. Dwgs. 244/2, 35, 49, 50, 51, 52, 55, and 56, all Rev. A

NOTICE: Bidders are required to acknowledge receipt of this amendment on the Bid Form, in the space provided, or by separate letter or telegram prior to opening of bids. Failure to acknowledge all amendments may cause rejection of the bid.

Necessity Verified

Am. 2
ARMY - C. of E. - Los Angeles

DECISION NO. A277-5058 - Mod. #2
(42 FR 31056 - June 17, 1977)
Statewide, Arizona

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	Education and/or Appr. Tr.
Change:					
Electricians (Flagstaff Area):					
Zone A					
Electricians	$ 12.20	.96	3%+.78		1/2%
Cable Splicers	12.20	.96	3%+.78		1/2%
Zone B					
Electricians	14.50	.96	3%+.78		1/2%
Cable Splicers	14.50	.96	3%+.78		1/2%
Electricians (Gallup Area-Northern Apache County):					
Electricians	12.60	.60	3%+.70		1/2%
Cable Splicers	13.65	.60	3%+.70		1/2%
Electricians (Globe-Miami Area):					
Zone A					
Electricians	13.09	6%	3%+8%		1/2%
Cable Splicers	13.34	6%	3%+8%		1/2%
Zone B					
Electricians	13.79	6%	3%+8%		1/2%
Cable Splicers	14.04	6%	3%+8%		1/2%
Zone C					
Electricians	14.39	6%	3%+8%		1/2%
Cable Splicers	14.64	6%	3%+8%		1/2%
Zone D					
Electricians	15.09	6%	3%+8%		1/2%
Cable Splicers	15.34	6%	3%+8%		1/2%
Electricians (Yuma Area):					
Zone A					
Electricians	11.88	5.25%	3%+8.35%		
Cable Splicers	12.13	5.25%	3%+8.35%		
Zone B					
Electricians	12.58	5.25%	3%+8.35%		
Cable Splicers	12.83	5.25%	3%+8.35%		
Zone C					
Electricians	13.18	5.25%	3%+8.35%		
Cable Splicers	13.43	5.25%	3%+8.35%		
Zone D					
Electricians	13.88	5.25%	3%+8.35%		
Cable Splicers	14.13	5.25%	3%+8.35%		

BIDDING SCHEDULE

Item No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
1.	DIVERSION AND CONTROL OF WATER	1	Job	L.S.	_____
2.	CLEARING AND GRUBBING	1	Job	L.S.	_____
3.	STRIPPING	229,000	Cu. Yd.	_____	_____
4.	SCALING				
	a. FIRST 100 CU. YD.	100	Cu. Yd.	_____	_____
	b. OVER 100 CU. YD.	200	Cu. Yd.	_____	_____
5.	EXCAVATION, ABUTMENT	64,000	Cu. Yd.	_____	_____
6.	EXCAVATION, FOUNDATION	313,000	Cu. Yd.	_____	_____
7.	EXCAVATION, FOUNDATION TRENCH	59,000	Cu. Yd.	_____	_____
8.	EXCAVATION, CUT OFF TRENCH	146,000	Cu. Yd.	_____	_____
9.	EXCAVATION, DENTAL				
	a. FIRST 100 CU. YD.	100	Cu. Yd.	_____	_____
	b. OVER 100 CU. YD.	200	Cu. Yd.	_____	_____
10.	EXCAVATION, OUTLET WORKS	6,000	Cu. Yd.	_____	_____
11.	EXCAVATION, SPILLWAY	337,000	Cu. Yd.	_____	_____
12.	EXCAVATION, BY PASS CHANNEL	160,200	Cu. Yd.	_____	_____
13.	EXCAVATION, DRAINAGE CHANNEL	24,000	Cu. Yd.	_____	_____
13A.	EXCAVATION, OUTLET WORKS CHANNEL	60,000	Cu. Yd.	_____	_____
14.	EXCAVATION, ROADS	36,000	Cu. Yd.	_____	_____
15.	EXCAVATION, TOE	22,600	Cu. Yd.	_____	_____
16.	FILL, OUTLET WORKS	3,000	Cu. Yd.	_____	_____
17.	FILL, ROADS	134,000	Cu. Yd.	_____	_____
18.	FILL, MISCELLANEOUS	131,000	Cu. Yd.	_____	_____

Item No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
45.	REINFORCED CONCRETE PIPE 108-INCH	170	Lin. Ft.	_____	_____
46.	PIPE CULVERT INLET AND OUTLET STRUCTURES	4	Each	_____	_____
47.	AGGREGATE BASE AND SURFACING	7,700	Cu. Yd.	_____	_____
48.	ASPHALT CONCRETE PAVEMENT	3,750	Ton	_____	_____
49.	TRAFFIC CONTROL DEVICES	1	Job	L.S.	_____
50.	GUARD RAIL	110	Lin. Ft.	_____	_____
51.	WATER SURFACE RECORDING FACILITY	1	Job	L.S.	_____
52.	INSTRUMENTATION	1	Job	L.S.	_____
53.	OVERLOOK STRUCTURE AND VIEW POINT SLAB	1	Job	L.S.	_____
54.	OVERLOOK RESTROOM	1	Job	L.S.	_____
55.	LANDSCAPE FILL	19,000	Cu. Yd.	_____	_____
56.	PLANTING	1	Job	L.S.	_____
57.	SEEDING	28	Acre	_____	_____
58.	PROJECT SIGN	1	Job	L.S.	_____
59.	TOPSOILING	21,000	Cu. Yd.	_____	_____
			TOTAL AMOUNT		$_____

NOTE: All extensions of the unit prices shown will be subject to verification by the Government. In case of variation between the unit price and the extension, the unit price will be considered to be the bid.

If a bid or modification to a bid based on unit prices is submitted which provides for a lump sum adjustment to the total estimated cost, the application of the lump sum adjustment to each unit price in the bidding schedule must be stated. If it is not stated, the bidder agrees that the lump sum adjustment shall be applied on a pro rata basis to every unit price in the bidding schedule.

Amounts and prices shall be indicated in either figures or words, not both.

Bids shall be submitted on all items of the Bidding Schedule.

Reference: DACW09-77-B-0031-0004

Bid Opening Date: 30 August 1977

U. S. ARMY ENGINEER DISTRICT, LOS ANGELES
P. O. Box 2711
Los Angeles, California 90053

19 August 1977

AMENDMENT NO. 4

I. Specifications, Reference No. DACW09-77-B-0031, covering "Cave Buttes Dam, Phoenix, Arizona," are modified as follows:

22. PART I, SPECIAL PROVISIONS.

22.1 Page S-1. After paragraph 1.1 add:

1.2 Overlook Facilities. The Construction of the Overlook Structure, Restroom, Viewpoint slab, footpaths, road and parking area shall be completed prior to 30 June 1978.

1.3 Access Road. Access road improvement between Sta. 90+10.15 and Sta. 22+58.65 shall not begin prior to 1 April 1978.

23. SECTION 1A, GENERAL REQUIREMENTS.

23.1 Page 1A-3. After paragraph 10.6.1 add:

10.6.2 Gravel Pit Operations. A commercial gravel pit located downstream of the dam embankment approximately 1/2 mile north of Borrow Area No. 6 will be in operation during the entire construction period. The Contractor shall not interfere with the gravel pit operations and, where required, use of access roads shall be closely coordinated. The Contractor shall provide flagmen at locations where control of traffic will be required.

24. SECTION 1B, MEASUREMENT AND PAYMENT.

24.1 Page 1B-1, paragraph 2. At the end of the paragraph add: Payment will not include salvaging and replanting cacti which cost is included in the contract price for planting.

25. SECTION 2B, CLEARING AND GRUBBING.

25.1 Page 2B-1. At the end of paragraph 1.1 add: Except for those cacti which have been tagged for salvaging, all other cacti in the area to be cleared and grubbed shall be included in the clearing and grubbing operations.

26. SECTION 3C, EMBANKMENT AND FOUNDATION PREPARATION.

26.1 Page 3C-2, paragraph 5.1, lines 9 and 10. Delete "6-inch layers * * * embankment fill material" and insert: 4-inch layers and compacted with power tampers or other approved methods to a density of at least 90% maximum density for Zone III material and 95% of maximum density for Zone I and II material. Determination of density shall be in accordance with section: FILLS AND SUBGRADE PREPARATION.

26.2 Page 3C-3, paragraph 7.1, line 1. Delete "in the borrow areas" and insert: at the source

27. SECTION 10B, TREES, SHRUBS, AND CACTI.

27.1 Page 10B-3. At the end of paragraph 7.1.7 add: The Contractor shall certify that each cactus is in a growing, healthy condition prior to salvaging.

Am. 4

II. This amendment shall be attached to and shall become a part of the specifications.

HUGH G. ROBINSON
Colonel, Corps of Engineers
District Engineer

NOTICE: Bidders are required to acknowledge receipt of this amendment on the Bid Form, in the space provided, or by separate letter or telegram prior to opening of bids. Failure to acknowledge all amendments may cause rejection of the bid.

Necessity
Verified

Am. 4
ARMY - C. of E. - Los Angeles

Reference: DACW09-77-B-0031-0003

Bid Opening Date: 30 August 1977

U. S. ARMY ENGINEER DISTRICT, LOS ANGELES
P. O. Box 2711
Los Angeles, California 90053

18 August 1977

AMENDMENT NO. 3

I. Specifications, Reference No. DACW09-77-B-0031, covering "Cave Buttes Dam, Phoenix, Arizona," and the drawings are modified as follows:

11. BID FORM. Delete Page B-3 (Revised) and insert the inclosed Page B-3 (Revised 8/18/77).

12. PART I, SPECIAL PROVISIONS.

12.1 Pages S-1 and S-2, paragraph 3.1. Insert "Revision A" after the following drawing numbers:

244/4
244/62

12.2 Page S-10. Delete paragraph 12.

12.3 Page S-12. After paragraph 18 add:

19. PAYMENT FOR MOBILIZATION AND PREPARATORY WORK, PAYMENT ITEM NO. 1A. (1965 JAN).

(a) Payments will be made under this contract on the actual expenditures made by the Contractor for mobilization and preparatory work under payment Item No. 1A, as follows: The Contractor may submit to the Contracting Officer certified accounts of the actual payments made by him for construction plant exceeding $10,000 in value per unit, as appraised by the Contracting Officer at the site of the work, acquired for the execution of the work; for the transportation of all plant and equipment to the site; for material purchased for the prosecution of the contract, but not to be incorporated in the work; for construction of camps, access roads or railroads, trailer courts, mess halls, dormitories or living quarters, field headquarters facilities and construction yards, and for personal services and hire of plant on work preparatory to commencing actual work on the construction items for which payment is provided under the terms of the contract. Accounts so submitted must be accompanied by certificate of the Contractor, supported by receipted bills or certified copies of payrolls and freight bills, showing that he has acquired said construction plant and material free from all encumbrances and agreement that it will not be removed from the site and that structures and facilities prepared or erected for the prosecution of the contract work will be maintained and not dismantled prior to the completion and acceptance of the entire work without the written permission of the Contracting Officer. If the Contracting Officer finds that said construction plant, material, equipment and the mobilization and preparatory work performed are suitable and necessary to the efficient prosecution of the contract and that the said preparatory work has been done with proper economy and efficiency, payment, less the prescribed retained percentage, will be made therefor to the Contractor. Payment for construction plant, material and structures and facilities prepared or erected for prosecution of the contract work shall not exceed the cost thereof to the Contractor less the estimated value upon the completion of the contract as determined by the Contracting Officer. In no event shall such payment exceed 100% of the cost to the Contractor of any such items which have no appreciable salvage value and 75% of the cost to the Contractor of such items which have an appreciable salvage value. No payment will be made in reimbursement of the premium paid on the performance bond or payment bond. The findings of the Contracting Officer as to the suitability and value of the construction plant, equipment, materials, structures or facilities shall not be subject to appeal.

(b) Payments for mobilization and preparatory work will be made in accordance with (a) above, and such payments will be deducted from the contract price for Item No. 1A "Mobilization and Preparatory Work" until the total amount thus charged to this item reduces this item to zero, after which no further payments will be made under this item. If the total of such payments made does not reduce this item to zero, the balance will be paid to the Contractor in the final payment under the contract. The retained percentage will be paid in accordance with the clause of this contract entitled "Payments to Contractor."

Am. 3

Should the contract be terminated as provided in paragraph "Funds Available for Payments" because of the failure of Congress to provide additional funds for its completion, the Contractor may be permitted to remove plant and material on which payments for preparatory work have been made subject to an equitable deduction from the amounts due the Contractor to reimburse the United States for the unabsorbed value of such plant and material. (1965 APR OCE)

13. SECTION 1A, GENERAL REQUIREMENTS.

13.1 Page 1A-3.

13.1.1 After paragraph 10.5.4 add:

10.5.5 Cave Creek Road Detour. The Contractor shall notify the Contracting Officer and the Maricopa County Flood Control District not less than 30 days in advance of the date the detour will be required. The construction of the detour will require not more than 10 calendar days. The Maricopa Flood Control District shall be notified through:

Chief Engineer and General Manager
3335 West Durango Street
Phoenix, Arizona 85009

Telephone (602) 262-1501

10.5.6 Relocation of Telephone Cable. The telephone cable in the vicinity of Cave Creek Road and Dike No. 2 will be temporarily and permanently relocated by others. The Contractor shall notify the Contracting Officer and the Mountain Bell Telephone Company in writing not less than 30 days in advance of the date the relocation will be required. The Contractor shall allow a period of 30 days for the temporary relocation of the cable and 10 days for the permanent relocation of the cable. The Mountain Bell Telephone Company shall be notified through the following representative:

Mr. Bob Daniels
4425 West Olive Avenue
Glendale, Arizona 85302

Telephone 602 973-7415

Am. 3

13.2 Page 1A-5.

13.2.1 After paragraph 15.4 add:

16. AVAILABILITY OF WATER. Existing wells located within the reservoir area are not available for use. These wells will be plugged and capped by others during construction. The Consolidated Water Company has commercial facilities located approximately 7.5 miles from the project site. The person to contact concerning availability of water from this source is Mr. Richard Stewart, Consolidated Water Company, 2837 West Rosegarden Lane, Phoenix, Arizona 85027, Telephone 602 942-9150.

14. SECTION 1D, ENVIRONMENT PROTECTION.

14.1 Page 1D-3.

14.1.1 Paragraph 12.1, line 3. Delete "over the borrow area No. 3" and insert: over all of the borrow areas upon completion of their usage.

14.1.2 At the end of paragraph 12.1 add: Material to be shredded shall include roots of a size larger than 2 inches and material from clearing operations meeting the size requirements specified herein.

15. SECTION 3A, EXCAVATION.

15.1 Page 3A-1, paragraph 1.4, line 11. Delete "replaced with appropriate material" and insert: replaced with concrete

15.2 Page 3A-2.

15.2.1 Delete paragraph 1.5.1 and insert:

1.5.1 Excess Stone. Excess stone from Borrow Area No. 5 larger than 6 inches in size shall be disposed of in the streambed downstream of the toe of the dam embankment as directed. Excess stone from Borrow Area No. 6 larger than 6 inches in size shall be disposed of adjacent to Borrow Area No. 6 as directed.

15.2.2 Paragraph 9, line 2. Delete "from t e outlet works" and insert: from the outlet works

15.2.3 Paragraph 12, line 8. Delete "specified 5n section" and insert: specified in section

16. SECTION 3B, FILLS AND SUBGRADE PREPARATION.

16.1 Page 3B-2.

16.1.1 Paragraph 3.3, line 3. Delete "for Zone III" and insert: for Zone II or Zone III material, as applicable, and

17. SECTION 3C, EMBANKMENTS AND FOUNDATION PREPARATION.

17.1 Page 3C-2, paragraph 5.2.1, line 1. Delete "All bedrock surfaces" and insert: Where indicated, bedrock surfaces

17.2 Page 3C-3, paragraph 6.7, line 12. Delete "greater than 6 inches" and insert: greater than 9 inches

18. SECTION 4J, DRILLING AND GROUTING.

18.1 Page 4J-1, paragraph 2.1, line 2. Delete "the spillway crest, the outlet works and Dike I" and insert: the outlet works, and Dikes No. 1 and No. 2

19. SECTION 5D, STONE PROTECTION.

19.1 Page 5D-3, paragraph 2.5.3, line 1. Delete "between 4 and 12 inches" and insert: between 3 and 12 inches

Am. 3

20. SECTION 10A, SEEDING.

20.1 Page 10A-1, paragraph 2.3.1.1 a, line 1. Delete "Dam and Dike Embankments" and insert: For All Seeded Areas

20.2 Page 10A-2. Delete paragraph 2.3.1.1 b.,(including seed mixture).

20.3 Page 10A-3.

20.3.1 Paragraph 4.2, line 2. Delete "slurry of prepared wood pulp" and insert: slurry of wood cellulose fiber mulch.

20.3.2 Delete paragraphs 5. 5.1, 5.2, 5.3, and 5.4 and insert:

5. PREPARATION OF SURFACE. The surface shall be cleared of trash and debris and other materials that might hinder the work or subsequent maintenance.

20.3.3 Delete paragraphs 6. 6.1, and 6.2.

20.3.4 Delete paragraph 7.1 and insert:

7.1 General. Seed shall be sown between dates of 15 September and 15 March unless otherwise directed in writing. When delays in operations extend the work beyond the most favorable planting season for species designated or when conditions are such by reason of drought, high winds excessive moisture, or other factors that satisfactory results are not likely to be obtained, work shall be halted as directed and resumed only when conditions are favorable or when approved alternate or corrective measures and procedures have been effected.

20.4 Pages 10A-3 and 10A-4. Delete paragraph 7.2 and insert:

7.2 Native-Grass Seeding shall be accomplished with hydraulic seeders. Sowing rates shall be adjusted to provide pure live seed of designated species in the following amounts:

Seed Kind	Pounds of Pure Live Seed Per Acre
Atriplex glauca	10 pounds
Atriplex semibaccata	5 pounds
Cassia couvsii	5 pounds
Cercidium microphyllum	3 pounds
Dianthus bedfordi	4 pounds
Encelia farinosa	5 pounds
Eschscholtzia californica	5 pounds
Nicotiana glauca	1 pound
Plantago insulavis	10 pounds

20.5 Page 10A-4. Delete paragraphs 8, 9, and 10.

20.5.1 Paragraph 11, lines 3 and 4. Delete "Immediately after seeding * * * maintain complete growth.

21. DRAWINGS.

21.1 Drawing, File No. 244/9. GENERAL NOTES.

21.1.1 Note 1, line 2. Delete "Spillway Sill" and insert: Dike No. 1

21.1.2 After note 10 add:

11. Grout Holes on the right abutment of Dike No. 2 between Sta. 51+00 and Sta. 53+00 shall be drilled at angles perpendicular to the rock surface.

21.2 Drawing, File No. 244/36. Elevation E-E. Delete "Chan Sta. 54+00" and insert: Chan. Sta. 54+20

21.3 Drawing, File No. 244/53, Section C-C. Add #5 x 4'-0" diagonal reinforcement at each top corner of 4'-8" x 3'-6" opening. Diagonal reinforcement shall have a minimum cover of 3 inches.

Am. 3

21.4 Drawing, File No. 244/54.

21.4.1 Elevation A-A. To the elevation add the following note:

NOTE: Install contraction joints in retaining wall and footing at locations 20'-0". Left of ℄ Intake Tower and 22'-0" right of ℄ Intake Tower.

21.4.2 Section B-B.

21.4.2.1 Note, line 3. Delete "ON SHT. 54" and insert: On SHT 53

21.4.3 Section E-E in lower right hand corner of sheet. Delete title of section "SECTION E-E" and insert: SECTION A-A. Change section designation in SECTION B-B to agree with the new section designation.

21.5 Drawing, File No. 244/57.

21.5.1 TURNAROUND AND PARKING AREA AT RECORDER HOUSE.

21.5.1.1 Delete centerline of turnaround Station "Sta. 31+70" and insert: Sta. 31+70.67

21.5.1.2 Recorder House. Delete the dimension of the Recorder House "4'" Dimension and insert: 4.67'

21.6 Drawing, File No. 244/62 Rev. A., PLAN, STA. 106+75. After "INSTALL DOUBLE DRIVE GATES" add: FOR DETAILS SEE SHT. 57

21.7 Drawing, File No. 244/64. TYPICAL LOOP ROAD SECTION. Below the section title delete "Sta. 158+09.76 to Sta. 161+50 and Sta. 162+47 to Sta. 168+78.58" and insert: Sta. 158+09.76 to Sta. 161+29.38 and Sta. 162+67 to Sta. 168+78.58.

21.8 Drawing, File No. 244/69.

21.8.1 ℄ PROFILE. At Sta. 120+30.46 delete "Invert EL. 1624.73" and insert: Invert EL 1625.49

21.8.2 TYPICAL SECTION. Delete 'A.C. Pavement on 4"' and insert: A.C. Pavement on 4" or 5"

21.9 Drawing, File No. 244/76.

21.9.1 SHRUB AND CACTUS SCHEDULE. Delete the Note below the schedule and insert:

NOTE: Cactus plants to be salvaged will be tagged by the Contracting Officer. Approximately 6 Barrel plants and 6 Saguara plants will be tagged.

21.9.2 CACTUS, STAKING DETAIL (2 DETAILS) Delete "D.G. backfill" and insert: soil backfill

II. This amendment shall be attached to and shall become a part of the specifications.

HUGH G. ROBINSON
Colonel, Corps of Engineers
District Engineer

2 Incls.
1. Page B-3 (Rev.) 8/18/77)
2. Dwgs. 244/4 and 244/62 both Rev. A

NOTICE: Bidders are required to acknowledge receipt of this amendment on the Bid Form, in the space provided, or by separate letter or telegram prior to opening of bids. Failure to acknowledge all amendments may cause rejection of the bid.

Necessity Verified

Am. 3
ARMY - C. of E. - Los Angeles

BIDDING SCHEDULE

Item No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
1.	DIVERSION AND CONTROL OF WATER	1	Job	L.S.	_____
1A.	MOBILIZATION AND PREPARATORY WORK	1	Job	L.S.	_____
2.	CLEARING AND GRUBBING	1	Job	L.S.	_____
3.	STRIPPING	229,000	Cu. Yd.	_____	_____
4.	SCALING				
	a. FIRST 100 CU. YD.	100	Cu. Yd.	_____	_____
	b. OVER 100 CU. YD.	200	Cu. Yd.	_____	_____
5.	EXCAVATION, ABUTMENT	64,000	Cu. Yd.	_____	_____
6.	EXCAVATION, FOUNDATION	313,000	Cu. Yd.	_____	_____
7.	EXCAVATION, FOUNDATION TRENCH	59,000	Cu. Yd.	_____	_____
8.	EXCAVATION, CUT OFF TRENCH	146,000	Cu. Yd.	_____	_____
9.	EXCAVATION, DENTAL				
	a. FIRST 100 CU. YD.	100	Cu. Yd.	_____	_____
	b. OVER 100 CU. YD.	200	Cu. Yd.	_____	_____
10.	EXCAVATION, OUTLET WORKS	6,000	Cu. Yd.	_____	_____
11.	EXCAVATION, SPILLWAY	337,000	Cu. Yd.	_____	_____
12.	EXCAVATION, BY PASS CHANNEL	160,200	Cu. Yd.	_____	_____
13.	EXCAVATION, DRAINAGE CHANNEL	24,000	Cu. Yd.	_____	_____
13A.	EXCAVATION, OUTLET WORKS CHANNEL	60,000	Cu. Yd.	_____	_____
14.	EXCAVATION, ROADS	36,000	Cu. Yd.	_____	_____
15.	EXCAVATION, TOE	22,600	Cu. Yd.	_____	_____
16.	FILL, OUTLET WORKS	3,000	Cu. Yd.	_____	_____
17.	FILL, ROADS	134,000	Cu. Yd.	_____	_____
18.	FILL, MISCELLANEOUS	131,000	Cu. Yd.	_____	_____

LIBRARY

STANDARD FORM 20
JANUARY 1961 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.401

REFERENCE: DACW09-77-B-0031

INVITATION FOR BIDS
(CONSTRUCTION CONTRACT)

DATE: 26 July 1977

NAME AND LOCATION OF PROJECT

CAVE BUTTES DAM
PHOENIX
ARIZONA

DEPARTMENT OR AGENCY

DEPARTMENT OF THE ARMY

BY (Issuing office)

U. S. ARMY ENGINEER DISTRICT, LOS ANGELES

Sealed bids in duplicate for the work described herein will be received until 1 p.m. local time at the place of bid opening, 25 August 1977,

at Room 1030 (South Tower), 2721 North Central Avenue, Phoenix, Arizona 85004,

and at that time publicly opened.

Information regarding bidding material, bid guarantee, and bonds

BID BONDS. Each bidder shall submit with his bid a Bid Bond (Standard Form 24) with good and sufficient surety or sureties acceptable to the Government, or other security as provided in paragraph 4 of Instructions to Bidders (Standard Form 22) in the form of 20% of the bid price or $3,000,000, whichever is lesser The bid bond penalty may be expressed in terms of a percentage of the bid price or may be expressed in dollars and cents.

PERFORMANCE AND PAYMENT BONDS Within 5 days after the prescribed forms are presented to the bidder to whom award is made for signature, a written contract on the form prescribed by the specifications shall be executed and two bonds, each with good and sufficient surety or sureties acceptable to the Government, furnished; namely a performance bond (Standard Form 25) and a payment bond (Standard Form 25-A). The penal sums of such bonds will be as follows.

(a) Performance Bond. The penal sum of the performance bond shall equal 100% of the contract price.

(b) Payment Bond.

(1) When the contract price is $1,000,000 or less, the penal sum will be 50% of the contract price

(2) When the contract price is in excess of $1,000,000, but not more than $5,000,000 the penal sum shall be 40% of the contract price.

(3) When the contract price is more than $5,000,000, the penal sum shall be $2,500,000.

Any bonds furnished will be furnished by the Contractor to the Government prior to commencement of contract performance.

Description of work

The work consists of construction of dam, dikes, spillway, outlet works, intake tower and appurtenant work, complete.

LIBRARY

☆ U.S. GOVERNMENT PRINTING OFFICE: 1969—O-572728

READ THE FOLLOWING IN CONJUNCTION WITH INSTRUCTIONS TO BIDDERS (U.S. STANDARD FORM 22).

1. PLANT AND EQUIPMENT. Each bidder shall, upon request of the Contracting Officer, furnish a list of the plant available to the bidder and proposed for use on the work.

2. MODIFICATIONS PRIOR TO DATE SET FOR OPENING BIDS. The right is reserved, as the interest of the Government may require, to revise or amend the specifications or drawings, or both prior to the date set for opening bids. Such revisions and amendments, if any, will be announced by an amendment or amendments to this Invitation for Bids. If the revisions and amendments are of a nature which requires material changes in quantities or prices bid or both, the date set for opening bids may be postponed by such number of days as in the opinion of the District Engineer will enable bidders to revise their bids. In such cases, the amendment will include an announcement of the new date for opening bids.

3. BIDDERS are required to acknowledge receipt of all amendments to this Invitation on the Bid Form (Standard Form 21) in the space provided, or by separate letter or telegram prior to opening of Bids. Failure to acknowledge all amendments may cause the rejection of the bid.

4. NOTICE REGARDING BUY AMERICAN ACT (1970 SEP). The Buy American Act (41 U.S.C. 10a-10d) generally requires that only domestic construction material be used in the performance of this contract. Exception from the Buy American Act shall be permitted only in the case of nonavailability of domestic construction materials. A bid or proposal offering nondomestic construction material will not be accepted unless specifically approved by the Government. When a bidder or offeror proposes to furnish nondomestic construction material, his bid or proposal must set forth an itemization of the quantity, unit price, and intended use of each item of such nondomestic construction material. When offering nondomestic construction material pursuant to this paragraph, bids or proposals may also offer, at stated prices, any available comparable domestic construction material, so as to avoid the possibility that failure of a nondomestic construction material to be acceptable under this paragraph will cause rejection of the entire bid.

5. AVAILABILITY OF SPECIFICATIONS, STANDARDS AND DESCRIPTIONS (1977 JAN) Specifications, standards and descriptions cited in this solicitation are available as indicated below:

5.1 Unclassified Federal, Military and Other Specifications and Standards (Excluding Commercial), and Data Item Descriptions. Submit required on DD Form 1425 (Specifications and Standards Requisition) to:

Commanding Officer
U.S. Naval Publications and Forms Center
5801 Tabor Avenue
Philadelphia, Pa. 19120

The Department of Defense Index of Data Item Descriptions (TD-3) may be ordered on the DD Form 1425. The Department of Defense Index of Specifications and Standards (DODISS) may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. When requesting a specification or standard, the request shall indicate the title, number, date and any applicable amendment thereto by number and date. When requesting a data item description, the request shall cite the applicable data item number set forth in the solicitation. When DD Form 1425 is not available, the request may be submitted in letter form, giving the same information as listed above, and the solicitation or contract number involved. Such requests may also be made to the activity by Telex No. 834295, Western Union No. 710-670-1685, or telephone (area code 215-697-3321) in case of urgency.

5.2 Commercial Specifications, Standards and Descriptions. These specifications, standards and descriptions are not available from Government sources. They may be obtained from the publishers.

6. AVAILABILITY FOR EXAMINATION OF SPECIFICATIONS, STANDARDS, DRAWINGS, AND OTHER PERTINENT DOCUMENTS. The specifications, standards, drawings, and other pertinent documents cited in this solicitation may be examined at the following location:

U.S. Army Engineer District, Los Angeles
300 No. Los Angeles Street
Los Angeles, California 90053

7. In addition to the immediate site of construction, the Department of Labor has stated that the Davis-Bacon Act applies to Contractor's operations connected with temporary facilities located off the immediate site of construction such as batch plants, sand pits, rock quarries and similar operations which have been set up exclusively to furnish materials for the contract. Therefore, employees related to these temporary facilities are considered on-site employees, and the Contractor shall maintain complete records as set out in the Labor Standards Provisions of the contract.

8. The Government further reserves the right to make award of any or all schedules of any bid, unless the bidder qualifies such bid by specific limitation; also to make award to the bidder whose aggregate bid on any combination of bid schedules is low. For the purpose of this Invitation for Bids, the word "item" as used in paragraph 10(c) of Standard Form 22, shall be considered to mean "schedule."

Read the following in conjunction with instructions to bidders (U.S. Standard Form 22.)

9. DRAWINGS. Sets of drawings, half-size, and of specifications will be furnished upon receipt of payment of $7.90 per set. If individual plan sheets are requested, they will be furnished at the rate of $0.10 for half-size, for each sheet requested, but with a minimum charge of $1.00. The maximum charge shall not exceed the charge for a full set of plans. No refund of the payment for drawings will be made and the drawings need not be returned to the District Engineer. Additional copies of the specifications alone will be furnished an applicant at the rate of $1.00 per copy. Payments will be made by cash, check or money order and delivered to the U. S. Army Engineer District, Los Angeles, 300 North Los Angeles Street, Los Angeles, California. Checks and money orders should be made payable to "Treasurer of the United States."

10. HAND CARRIED BIDS. Hand carried bids shall be deposited in Room 1030, (South Tower), 2721 North Central Avenue, Phoenix, Arizona, prior to the time and date set for opening of bids or bids may be delivered to Room 1030 immediately prior to bid opening time.

11. TELEGRAPHIC MODIFICATIONS TO BIDS should be addressed to:

U. S. Army Engineer District, Los Angeles
Resident Office
2721 North Central Avenue
Phoenix, Arizona 85004

12. NOTE THE AFFIRMATIVE ACTION REQUIREMENT OF THE EQUAL OPPORTUNITY CLAUSE WHICH MAY APPLY TO THE CONTRACT RESULTING FROM THIS SOLICITATION.

13. NOTE THE CERTIFICATION OF KONSEGREGATED FACILITIES IN THIS SOLICITATION. Bidders, offerors and applicants are cautioned to note the "Certification of Non-Segregated Facilities" in the solicitation. Failure of a bidder or offeror to agree to the certification will render his bid or offer nonresponsive to the terms of solicitations involving awards of contracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause. (1975 OCT)

14. ADDITIONAL INFORMATION pertaining to these plans and specifications may be obtained by writing or calling (collect calls not accepted) U. S. Army Engineer District, Los Angeles, Attn: Mr. R. A. Hightower, P. O. Box 2711, Los Angeles, California 90053. Telephone 213 688-5493.

15. Deleted.

16. PRE-AWARD SURVEY.

16.1 As part of the pre-award survey, the low bidders will be required to, within 48 hours after bid opening, submit a detailed list of all equipment to be used on the work, including earth moving, materials handling, concrete batching, hauling, paving, and all associated equipment, with supporting evidence of its availability, as well as written assurance said equipment is to be committed to this project alone. Release of any equipment from the project to any other work is subject to the approval of the Contracting Officer.

16.2 Failure to provide timely and satisfactory information data required for the pre-award survey may cause rejection of the bid.

17. ARITHMETIC DISCREPANCIES.

(a) For the purpose of initial evaluation of bids, the following will be utilized in resolving arithmetic discrepancies found on the face of the bidding schedule as submitted by bidders:

(1) Obviously misplaced decimal points will be corrected;

(2) In case of discrepancy between unit price and extended price, the unit price will govern;

(3) Apparent errors in extension of unit prices will be corrected; and

(4) Apparent errors in addition of lump-sum and extended prices will be corrected.

(b) For the purposes of bid evaluation, the Government will proceed on the assumption that the bidder intends his bid to be evaluated on the basis of the unit prices, extensions, and totals arrived at by resolution of arithmetic discrepancies as provided above and the bid will be so reflected on the abstract of bids.

18. SITE INSPECTION. A conducted tour of the site will be made on 11 and 16 August 1977, at 10:00 a.m. Those wishing to attend the tour should notify the Project Engineer, Mr. Verle Cox by telephone at (602) 261-3851, at least 24 hours prior to the time scheduled. Bidders should furnish their own transportation and point of assembly will be at the intersection of Deer Valley Drive and Cave Creek Road, Phoenix, Arizona.

19. MINIMUM ACCEPTANCE PERIOD (1975 MAR). Bids allowing less than the number of calendar days specified in the "Bid" portion of SF 19 (or on the reverse of SF 21 as applicable) for acceptance by the Government will be rejected as nonresponsive.

20. PRE-AWARD ON SITE EQUAL OPPORTUNITY COMPLIANCE REVIEW (1970 AUG). In accordance with regulations of the Office of Federal Contract Compliance, 41 CFR 60.1, effective 1 July 1968, an award in the amount of $1,000,000 or more will not be made under this solicitation unless the bidder and each of his known first-tier subcontractors (to whom he intends to award a subcontract of $1,000,000 or more) are found, on the basis of a compliance review, to be able to comply with the provisions of the Equal Opportunity clause of this solicitation.

21. EARTHWORK CROSSSECTION AND TABULATION SHEETS will be furnished upon receipt of payment of $15.00 per set. Payments will be made by cash, check, or money order and delivered to the U.S. Army Engineer District, Los Angeles, 300 North Los Angeles Street, Los Angeles, California. Checks and money orders should be made payable to the "Treasurer of the United States."

* * * * *

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY

The Bidder's attention is called to the "EQUAL OPPORTUNITY" and "LOCAL AFFIRMATIVE ACTION PLAN" clauses of the contract.

The acceptable ranges of minority manpower utilization, expressed in percentage terms, are as follows:

TRADE		BIDDER'S MINORITY MANPOWER UTILIZATION GOALS (Percentage of Total Manhours)
All Construction Trades to be used in the performance of the contract	Until 11/30/71	5.0% - 10.0%
	From 12/1/71 Until 11/30/72	10.0% - 15.0%
	From 12/1/72 Until 11/30/73	15.0% - 20.0%
	From 12/1/73 Until 11/30/74	20.0% - 25.0%
	From 12/1/74 Until 11/30/76	25.0% - 30.0%

In the event that under a contract which is subject to these Bid Conditions any work is performed in a year later than the latest year for which acceptable ranges of minority manpower utilization have been determined herein, the ranges for 1974-1976 shall be applicable to such work.

The Bidder shall, within 5 days after a request therefor by the Contracting Officer or his duly authorized representative, submit the following information:

(a) A list of the construction trades he intends to use, either directly or through subcontractors at any tier, in the performance of the work covered by this solicitation; and

(b) A list of all current construction work or contracts to which he is a party in any capacity in the covered area.

As used in this NOTICE and the contract to result from this solicitation:

(a) "the covered area" means the area of jurisdiction of the Tucson and Phoenix Building and Construction Trades Council.

(b) "Director, OFCC" means the Director, Office of Federal Contract Compliance, United States Department of Labor, or any person to whom he delegates authority; and

(c) "minority" means Negro, Spanish-surnamed American, Oriental, and American Indian, and includes both men and women.

STANDARD FORM 22
OCTOBER 1969 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.401

INSTRUCTIONS TO BIDDERS

(CONSTRUCTION CONTRACT)

1. Explanations to Bidders. Any explanation desired by a bidder regarding the meaning or interpretation of the invitation for bids, drawings, specifications, etc., must be requested in writing and with sufficient time allowed for a reply to reach bidders before the submission of their bids. Any interpretation made will be in the form of an amendment of the invitation for bids, drawings, specifications, etc., and will be furnished to all prospective bidders. Its receipt by the bidder must be acknowledged in the space provided on the Bid Form (Standard Form 21) or by letter or telegram received before the time set for opening of bids. Oral explanations or instructions given before the award of the contract will not be binding.

2. Conditions Affecting the Work. Bidders should visit the site and take such other steps as may be reasonably necessary to ascertain the nature and location of the work, and the general and local conditions which can affect the work or the cost thereof. Failure to do so will not relieve bidders from responsibility for estimating properly the difficulty or cost of successfully performing the work. The Government will assume no responsibility for any understanding or representations concerning conditions made by any of its officers or agents prior to the execution of the contract, unless included in the invitation for bids, the specifications, or related documents.

3. Bidder's Qualifications. Before a bid is considered for award, the bidder may be requested by the Government to submit a statement regarding his previous experience in performing comparable work, his business and technical organization, financial resources, and plant available to be used in performing the work.

4. Bid Guarantee. Where a bid guarantee is required by the invitation for bids, failure to furnish a bid guarantee in the proper form and amount, by the time set for opening of bids, may be cause for rejection of the bid.

A bid guarantee shall be in the form of a firm commitment, such as a bid bond, postal money order, certified check, cashier's check, irrevocable letter of credit or, in accordance with Treasury Department regulations, certain bonds or notes of the United States. Bid guarantees, other than bid bonds, will be returned (*a*) to unsuccessful bidders as soon as practicable after the opening of bids, and (*b*) to the successful bidder upon execution of such further contractual documents and bonds as may be required by the bid as accepted.

If the successful bidder, upon acceptance of his bid by the Government within the period specified therein for acceptance (sixty days if no period is specified) fails to execute such further contractual documents, if any, and give such bond(s) as may be required by the terms of the bid as accepted within the time specified (ten days if no period is specified) after receipt of the forms by him, his contract may be terminated for default. In such event he shall be liable for any cost of procuring the work which exceeds the amount of his bid, and the bid guarantee shall be available toward offsetting such difference.

5. Preparation of Bids. (*a*) Bids shall be submitted on the forms furnished, or copies thereof, and must be manually signed. If erasures or other changes appear on the forms, each erasure or change must be initialed by the person signing the bid. Unless specifically authorized in the invitation for bids, telegraphic bids will not be considered.

(*b*) The bid form may provide for submission of a price or prices for one or more items, which may be lump sum bids, alternate prices, scheduled items resulting in a bid on a unit of construction or a combination thereof, etc. Where the bid form explicitly requires that the bidder bid on all items, failure to do so will disqualify the bid. When submission of a price on all items is not required, bidders should insert the words "no bid" in the space provided for any item on which no price is submitted.

(*c*) Unless called for, alternate bids will not be considered.

(*d*) Modifications of bids already submitted will be considered if received at the office designated in the invitation for bids by the time set for opening of bids. Telegraphic modifications will be considered, but should not reveal the amount of the original or revised bid.

6. Submission of Bids. Bids must be sealed, marked, and addressed as directed in the invitation for bids. Failure to do so may result in a premature opening of, or a failure to open, such bid.

7. LATE BIDS, MODIFICATIONS OF BIDS OR WITHDRAWAL OF BIDS (1977 APR)

(a) Any bid received at the office designated in the solicitation after the exact time specified for receipt will not be considered unless it is received before award is made and either:

(i) it was sent by registered or certified mail not later than the fifth calendar day prior to the date specified for receipt of bids (e.g., a bid submitted in response to a solicitation requiring receipt of bids by the 20th of the month must have been mailed by the 15th or earlier); or,

(ii) it was sent by mail (or telegram if authorized) and it is determined by the Government that the late receipt was due solely to mishandling by the Government after receipt at the Government installation.

(b) Any modification or withdrawal of bid is subject to the same conditions as in (a) above. A bid may also be withdrawn in person by a bidder or his authorized representative, *provided* his identity is made known and he signs a receipt for the bid, but only if the withdrawal is made prior to the exact time set for receipt of bids.

(c) The only acceptable evidence to establish:

(i) the date of mailing of a late bid, modification or withdrawal sent either by registered or certified mail is the U.S. Postal Service postmark on the wrapper or on the original receipt from the U.S. Postal Service. If neither postmark shows a legible date, the bid, modification or withdrawal shall be deemed to have been mailed late. (The term "postmark" means a printed, stamped, or otherwise placed impression that is readily identifiable without further action as having been supplied and affixed on the date of mailing by employees of the U.S. Postal Service.)

(ii) the time of receipt at the Government installation is the time/date stamp of such installation on the bid wrapper or other documentary evidence of receipt maintained by the installation.

(d) Notwithstanding the above, a late modification of an otherwise successful bid which makes its terms more favorable to the Government will be considered at any time it is received and may be accepted.

NOTE: The term "telegram" includes mailgrams.

8. Deleted

9. Public Opening of Bids. Bids will be publicly opened at the time set for opening in the invitation for bids. Their content will be made public for the information of bidders and others interested, who may be present either in person or by representative.

10. Award of Contract. (*a*) Award of contract will be made to that responsible bidder whose bid, conforming to the invitation for bids, is most advantageous to the Government, price and other factors considered.

(*b*) The Government may, when in its interest, reject any or all bids or waive any informality in bids received.

(*c*) The Government may accept any item or combination of items of a bid, unless precluded by the invitation for bids or the bidder includes in his bid a restrictive limitation.

11. Contract and Bonds. The bidder whose bid is accepted will, within the time established in the bid, enter into a written contract with the Government and, if required, furnish performance and payment bonds on Government standard forms in the amounts indicated in the invitation for bids or the specifications.

☆ U. S. GOVERNMENT PRINTING OFFICE: 1971—423—808

12. Minority Business Subcontracting. Bidders are cautioned that compliance with the General Provision entitled Minority Business Enterprises Subcontracting Program requires the solicitation of minority business enterprise subcontractors and suppliers at the time of bid preparation where time or other circumstances would not permit such solicitation after award. Bidders desiring assistance in developing a source list of minority business enterprises are encouraged to contact minority contractor associations and appropriate Offices of Minority Business Enterprise, addresses of which may be obtained from U.S. Army Engineer District, Los Angeles, Office of Counsel, Labor Relations Advisor, 300 North Los Angeles Street, Los Angeles, California, 90053, telephone (213) 688-5390.

STANDARD FORM 21
DECEMBER 1965 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.401

BID FORM
(CONSTRUCTION CONTRACT)

REFERENCE

DACW09-77-B-0031

Read the Instructions to Bidders (Standard Form 22)
This form to be submitted in duplicate

DATE OF INVITATION
26 July 1977

NAME AND LOCATION OF PROJECT

CAVE BUTTES DAM
PHOENIX
ARIZONA

NAME OF BIDDER *(Type or print)*

(Date)

TO: U. S. ARMY ENGINEER DISTRICT, LOS ANGELES
P. O. Box 2711
Los Angeles, California 90053

In compliance with the above-dated invitation for bids, the undersigned hereby proposes to perform all work for the construction of dam and appurtenances,

in strict accordance with the General Provisions, specifications, schedules, drawings, and conditions, for the amounts set forth in the attached Bidding Schedule.

21-108

(Continue on other side)

EQUAL EMPLOYMENT COMPLIANCE (1974 APR) By submission of this offer, the offeror represents that, to the best of his knowledge and belief except as noted below, up to the date of this offer no written notice such as a show cause letter, a letter indicating probable cause, or any other formal written notification citing specific deficiencies, has been received by the offeror from any Federal Government agency or representative thereof that the offeror or any of its divisions or affiliates or know first-tier subcontractors is in violation of any of the provisions of Executive Order No. 11246 of September 24, 1965, Executive Order No. 11375 of October 13, 1967, or rules and regulations of the Secretary of Labor (41 CFR, Chapter 60) and specifically as to not having an acceptable affirmative action program or being in noncompliance with any other aspect of the Equal Employment Opportunity Program. It is further agreed that should there be any change in the status or circumstances between this date and the date of expiration of this offer or any extension thereof, the Contracting Officer will be notified promptly. (ASPR 7-2003.14(b)(3).

The undersigned agrees that, upon written acceptance of this bid, mailed or otherwise furnished within 30 calendar days ([illegible]) after the date of opening of bids, he will within 5 calendar days (unless a longer period is allowed) after receipt of the prescribed forms, execute Standard Form 23, Construction Contract, and give performance and payment bonds on Government standard forms with good and sufficient surety. (See paragraph No. 19 of the Invitation for Bids).

The undersigned agrees, if awarded the contract, to commence and to complete the work in accordance with the stipulations of Paragraph 1. of the SPECIAL PROVISIONS.

RECEIPT OF AMENDMENTS: *The undersigned acknowledges receipt of the following amendments of the invitation for bids, drawings, and/or specifications, etc. (Give number and date of each):*

The representations and certifications on the accompanying STANDARD FORM 19-B are made a part of this bid.

ENCLOSED IS BID GUARANTEE, CONSISTING OF	IN THE AMOUNT OF
NAME OF BIDDER (*Type or print*)	FULL NAME OF ALL PARTNERS (*Type or print*)
BUSINESS ADDRESS (*Type or print*) (*Include "ZIP Code"*)	
BY (*Signature in ink. Type or print name under signature*)	
TITLE (*Type or print*)	

DIRECTIONS FOR SUBMITTING BIDS: *Envelopes containing bids, guarantee, etc., must be sealed, marked, and addressed as follows:*

Envelopes shall be marked in
the upper left hand corner
Bid Under Reference No.
DACW09-77-B-0031

Envelopes shall be addressed:
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
P.O. Box 2711
Los Angeles, California 90053

CAUTION—Bids should not be qualified by exceptions to the bidding conditions.

☆ U.S. GOVERNMENT PRINTING OFFICE 1966 O—205-147—(115-F)

BIDDING SCHEDULE

Item No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
1.	DIVERSION AND CONTROL OF WATER	1	Job	L.S.	_____
2.	CLEARING AND GRUBBING	1	Job	L.S.	_____
3.	STRIPPING	578,000	Cu. Yd.	_____	_____
4.	SCALING				
	a. FIRST 100 CU. YD.	100	Cu. Yd.	_____	_____
	b. OVER 100 CU. YD.	200	Cu. Yd.	_____	_____
5.	EXCAVATION, ABUTMENT	64,000	Cu. Yd.	_____	_____
6.	EXCAVATION, FOUNDATION	313,000	Cu. Yd.	_____	_____
7.	EXCAVATION, FOUNDATION TRENCH	59,000	Cu. Yd.	_____	_____
8.	EXCAVATION, CUT OFF TRENCH	146,000	Cu. Yd.	_____	_____
9.	EXCAVATION, DENTAL				
	a. FIRST 100 CU. YD.	100	Cu. Yd.	_____	_____
	b. OVER 100 CU. YD.	200	Cu. Yd.	_____	_____
10.	EXCAVATION, OUTLET WORKS	20,300	Cu. Yd.	_____	_____
11.	EXCAVATION, SPILLWAY	357,500	Cu. Yd.	_____	_____
12.	EXCAVATION, BY PASS CHANNEL	172,800	Cu. Yd.	_____	_____
13.	EXCAVATION, DRAINAGE CHANNEL	24,000	Cu. Yd.	_____	_____
14.	EXCAVATION, ROADS	36,000	Cu. Yd.	_____	_____
15.	EXCAVATION, TOE	22,600	Cu. Yd.	_____	_____
16.	FILL, OUTLET WORKS	6,800	Cu. Yd.	_____	_____
17.	FILL, ROADS	124,000	Cu. Yd.	_____	_____
18.	FILL, MISCELLANEOUS	155,000	Cu. Yd.	_____	_____

BIDDING SCHEDULE (Continued)

Item No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
19.	EMBANKMENT, DAM ZONE I	289,000	Cu. Yd.	_____	_____
20.	EMBANKMENT, DAM ZONE II	1,262,600	Cu. Yd.	_____	_____
21.	EMBANKMENT, DAM ZONE III	975,000	Cu. Yd.	_____	_____
22.	EMBANKMENT, DIKES ZONE II	710,000	Cu. Yd.	_____	_____
23.	EMBANKMENT, DIKES ZONE III	270,000	Cu. Yd.	_____	_____
24.	ADDITIONAL ROLLING	500	Hour	_____	_____
25.	FILTER MATERIAL	6,900	Cu. Yd.	_____	_____
26.	STONE, TYPE I, DAM	32,300	Ton	_____	_____
27.	STONE, TYPE I, DIKES	39,500	Ton	_____	_____
28.	RIPRAP, DAM	65,450	Ton	_____	_____
29.	RIPRAP, DIKES	75,580	Ton	_____	_____
30.	GROUTING, STONEWORK	1,020	Cu. Yd.	_____	_____
31.	CONCRETE, SPILLWAY SILL	600	Cu. Yd.	_____	_____
32.	OUTLET WORKS	1	Job	L.S.	_____
33.	CONCRETE, DENTAL				
	a. FIRST 100 CU. YD.	100	Cu. Yd.	_____	_____
	b. OVER 100 CU. YD.	50	Cu. Yd.	_____	_____
34.	GROUT, SLURRY				
	a. FIRST 100 CU. FT.	100	Cu. Ft.	_____	_____
	b. OVER 100 CU. FT.	100	Cu. Ft.	_____	_____
35.	PORTLAND CEMENT	13,450	Cwt.	_____	_____

BIDDING SCHEDULE (Continued)

Item No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
36.	STEEL REINFORCEMENT	18,000	Lb.	_____	_____
37.	FOUNDATION DRILLING AND GROUTING				
	a. MOBILIZATION AND DEMOBILIZATION	1	Job	L.S.	_____
	b. DRILLING EXPLORATORY GROUT HOLES	225	Lin. Ft.	_____	_____
	c. DRILLING GROUT HOLES	6,850	Lin. Ft.	_____	_____
	d. PIPE FOR GROUT HOLES	420	Lin. Ft.	_____	_____
	e. DRILL SET-UPS	290	Each	_____	_____
	f. WASHING AND PRESSURE TESTING	135	Hour	_____	_____
	g. GROUT PUMP CONNECTION	270	Each	_____	_____
	h. PLACING GROUT	1,755	Sack	_____	_____
38.	DOUBLE DRIVE GATE	3	Each	_____	_____
39.	CORRUGATED METAL PIPE ARCH, 29x18-INCH	152	Lin. Ft.	_____	_____
40.	METAL END SECTIONS FOR 29x18-INCH CMP ARCH	3	Each	_____	_____
41.	CORRUGATED METAL PIPE, 36-INCH	564	Lin. Ft.	_____	_____
42.	METAL END SECTION FOR 36-INCH CMP	8	Each	_____	_____
43.	CORRUGATED METAL PIPE, 54-INCH	56	Lin. Ft.	_____	_____
44.	METAL END SECTION FOR 54-INCH CMP	1	Each	_____	_____

Item No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
45.	REINFORCED CONCRETE PIPE 108-INCH	170	Lin. Ft.	_____	_____
46.	PIPE CULVERT INLET AND OUTLET STRUCTURES	4	Each	_____	_____
47.	AGGREGATE BASE AND SURFACING	9,100	Cu. Yd.	_____	_____
48.	ASPHALT CONCRETE PAVEMENT	4,240	Ton	_____	_____
49.	TRAFFIC CONTROL DEVICES	1	Job	L.S.	_____
50.	GUARD RAIL	160	Lin. Ft.	_____	_____
51.	WATER SURFACE RECORDING FACILITY	1	Job	L.S.	_____
52.	INSTRUMENTATION	1	Job	L.S.	_____
53.	OVERLOOK STRUCTURE AND VIEW POINT SLAB	1	Job	L.S.	_____
54.	OVERLOOK RESTROOM	1	Job	L.S.	_____
55.	LANDSCAPE FILL	22,000	Cu. Yd.	_____	_____
56.	PLANTING	1	Job	L.S.	_____
57.	SEEDING	28	Acre	_____	_____
58.	PROJECT SIGN	1	Job	L.S.	_____

TOTAL AMOUNT $_____

NOTE: All extensions of the unit prices shown will be subject to verification by the Government. In case of variation between the unit price and the extension, the unit price will be considered to be the bid.

If a bid or modification to a bid based on unit prices is submitted which provides for a lump sum adjustment to the total estimated cost, the application of the lump sum adjustment to each unit price in the bidding schedule must be stated. If it is not stated, the bidder agrees that the lump sum adjustment shall be applied on a pro rata basis to every unit price in the bidding schedule.

Amounts and prices shall be indicated in either figures or words, not both.

Bids shall be submitted on all items of the Bidding Schedule.

STANDARD FORM 19-B
OCTOBER 1969 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.401
Rev. pei
ASPR 2-202.1(b)(1)

REPRESENTATIONS AND CERTIFICATIONS

(Construction Contract)
(For use with SF 19 and 21)

REFERENCE *(Enter same No.(s) as on SF 19/21)*

NAME AND ADDRESS OF BIDDER *(No., Street, City, State, and ZIP Code)*

DATE OF BID

In negotiated procurements, "bid" and "bidder" shall be construed to mean "offer" and "offeror."

The bidder makes the following representations and certifications as a part of the bid identified above. ***(Check appropriate boxes.)***

1. SMALL BUSINESS

He ☐ is, ☐ is not, a small business concern. *(For this purpose, a small business concern is a business concern, including its affiliates, which (a) is independently owned and operated, (b) is not dominant in the field of operation in which it is bidding on Government contracts, and (c) had average annual receipts for the preceding 3 fiscal years not exceeding* $12,000,000. *For additional information see governing regulations of the Small Business Administration.)*

2. CONTINGENT FEE (1974 APR)

The Offeror/Quoter represents and certifies as part of his proposal/quotation that: (Check all applicable boxes or blocks).

(a) He [ ] has, [ ] has not, paid or agreed to pay any company or person (other than a full-time bona fide employee working solely for the offeror/quoter) to solicit or secure this contract, and (b) he [ ] has, [ ] has not, paid or agreed to pay any company or person (other than a full-time bona fide employee working solely for the offeror/quoter) any fee, commission, percentage, or brokerage fee contingent upon or resulting from the award of this contract; and agrees to furnish information relating to (a) and (b) above, as requested by the Contracting Officer. *(For interpretation of the representation, including the term "bona fide employee", see Code of Federal Regulations, Title 41, Subpart 1-1.5.)*

If the offeror/quoter, by checking the appropriate box provided therefor, has represented that he has employed or retained a company or person (other than a full-time bona fide employee working solely for the offeror/quoter) to solicit or secure this contract, or that he has paid or agreed to pay any fee, commission, percentage, or brokerage fee to any company or person contingent upon or resulting from the award of this contract, he shall furnish, in duplicate, a complete Standard Form 119, Contractor's Statement of Contingent or Other Fees. If offeror/quoter has previously furnished a completed Standard Form 119 to the office issuing this solicitation, he may accompany his proposal/quotation with a signed statement (a) indicating when such completed form was previously furnished, (b) identifying by number the previous solicitation or contract, if any, in connection with which such form was submitted, and (c) representing that the statement in such form is applicable to this proposal/quotation. (ASPR 7-2002.1)

3. TYPE OF ORGANIZATION

He operates as an ☐ individual, ☐ partnership, ☐ joint venture, ☐ corporation, incorporated in State of . . . . . .

4. INDEPENDENT PRICE DETERMINATION

(a) By submission of this bid, each bidder certifies, and in the case of a joint bid each party thereto certifies as to his own organization, that in connection with this procurement:

(1) The prices in this bid have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;

(2) Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, in the case of a bid, or prior to award, in the case of a proposal, directly or indirectly to any other bidder or to any competitor; and

(3) No attempt has been made or will be made by the bidder to induce any other person or firm to submit or not to submit a bid for the purpose of restricting competition.

(b) Each person signing this bid certifies that:

(1) He is the person in the bidder's organization responsible within that organization for the decision as to the prices being bid herein and that he has not participated, and will not participate, in any action contrary to *(a)* (1) through *(a)* (3) above; or

(2) (i) He is not the person in the bidder's organization responsible within that organization for the decision as to the prices being bid herein but that he has been authorized in writing to act as agent for the persons responsible for such decision in certifying that such persons have not participated, and will not participate, in any action contrary to *(a)* (1) through *(a)* (3) above, and as their agent does hereby so certify; and (ii) he has not participated, and will not participate, in any action contrary to *(a)* (1) through *(a)* (3) above.

(c) This certification is not applicable to a foreign bidder submitting a bid for a contract which requires performance or delivery outside the United States, its possessions, and Puerto Rico.

(d) A bid will not be considered for award where *(a)* (1), *(a)* (3), or *(b)* above, has been deleted or modified. Where *(a)* (2) above, has been deleted or modified, the bid will not be considered for award unless the bidder furnishes with the bid a signed statement which sets forth in detail the circumstances of the disclosure and the head of the agency, or his designee, determines that such disclosure was not made for the purpose of restricting competition.

NOTE.—Bids must set forth full, accurate, and complete information as required by this invitation for bids (including attachments). The penalty for making false statements in bids is prescribed in 18 U.S.C. 1001.

THE FOLLOWING NEED BE CHECKED ONLY IF BID EXCEEDS $10,000 IN AMOUNT.

5. EQUAL OPPORTUNITY

He ☐ has, ☐ has not, participated in a previous contract or subcontract subject to the Equal Opportunity Clause herein, the clause originally contained in Section 301 of Executive Order No. 10925, or the clause contained in Section 201 of Executive Order No. 11114; he ☐ has, ☐ has not, filed all required compliance reports; and representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained prior to subcontract awards. *(The above representation need not be submitted in connection with contracts or subcontracts which are exempt from the clause.)*

6. PARENT COMPANY AND EMPLOYER IDENTIFICATION NUMBER

Each bidder shall furnish the following information by filling in the appropriate blocks:

(*a*) Is the bidder owned or controlled by a parent company as described below? ☐ Yes ☐ No. *(For the purpose of this bid, a parent company is defined as one which either owns or controls the activities and basic business policies of the bidder To own another company means the parent company must own at least a majority (more than 50 percent) of the voting rights in that company. To control another company, such ownership is not required; if another company is able to formulate, determine, or veto basic business policy decisions of the bidder, such other company is considered the parent company of the bidder This control may be exercised through the use of dominant minority voting rights, use of proxy voting, contractual arrangements, or otherwise.)*

(*b*) If the answer to (*a*) above is "Yes," bidder shall insert in the space below the name and main office address of the parent company.

NAME OF PARENT COMPANY	MAIN OFFICE ADDRESS *(No., Street, City, State, and ZIP Code)*

(*c*) Bidder shall insert in the applicable space below, if he has no parent company, his own Employer's Identification Number (E.I. No.) *(Federal Social Security Number used on Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941)*, or, if he has a parent company, the E.I. No. of his parent company.

EMPLOYER IDENTIFICATION NUMBER OF	PARENT COMPANY	BIDDER

7. CERTIFICATION OF NONSEGREGATED FACILITIES

(Applicable to (1) contracts, (2) subcontracts, and (3) agreements with applicants who are themselves performing federally assisted construction contracts, exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause.)

By the submission of this bid, the bidder, offeror, applicant, or subcontractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. He certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The bidder, offeror, applicant, or subcontractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin, because of habit, local custom, or otherwise. He further agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause; that he will retain such certifications in his files; and that he will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods):

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES

A Certification of Nonsegregated Facilities must be submitted prior to the award of a subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

U.S. GOVERNMENT PRINTING OFFICE 1969 O-[illegible] 300-456 (13-E)

8. MINORITY BUSINESS ENTERPRISE (1976 OCT)

The offeror represents that he ( ) is, ( ) is not, a minority business enterprise. A minority business enterprise is defined as a "business, at least fifty percent (50%) of which is owned by minority group members or, in case of publicly owned businesses, at least fifty-one percent (51%) of the stock of which is owned by minority group members." For the purpose of this definition, minority group members are Negroes, Spanish-speaking American persons, American-Orientals, American Indians, American Eskimos, and American-Aleuts.

9. CLEAN AIR AND WATER CERTIFICATION (1975 JUL)

(Applicable if the bid or offer exceeds $100,000, or the Contracting Officer has determined that orders under an indefinite quantity contract in any year will exceed $100,000, or a facility to be used has been the subject of a conviction under the Clean Air Act (42 U.S.C. 1857 c-8(c)(1)) or the Federal Water Pollution Control Act (33 U.S.C. 1319 (c)) and is listed by EPA, or is not otherwise exempt.)

The bidder or offeror certifies as follows:

(a) Any facility to be utilized in the performance of this proposed contract has ( ), has not ( ), been listed on the Environmental Protection Agency List of Violating Facilities.

(b) He will promptly notify the Contracting Officer, prior to award, of the receipt of any communication from the Director, Office of Federal Activities, U.S. Environmental Protection Agency, indicating that any facility which he proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities.

(c) He will include substantially this solicitation certification, including this paragraph (c), in every nonexempt subcontract.

STANDARD FORM 23
JANUARY 1961 EDITION
GENERAL SERVICES ADMINISTRATION
FED PROC REG (41 CFR) 1-16.401

Rev. LAD Nov. 70

CONSTRUCTION CONTRACT

(See instructions on reverse)

CONTRACT NO

DATE OF CONTRACT

NAME AND ADDRESS OF CONTRACTOR

CHECK APPROPRIATE BOX

- [ ] Individual
- [ ] Partnership
- [ ] Joint Venture
- [ ] Corporation, incorporated in the State of _____

DEPARTMENT OR AGENCY

CONTRACT FOR *(Work to be performed)*

PLACE

CONTRACT PRICE *(Express in words and figures)*

ADMINISTRATIVE DATA *(Optional)*

The United States of America (hereinafter called the Government), represented by the Contracting Officer executing this contract, and the individual, partnership, joint venture, or corporation named above (hereinafter called the Contractor), mutually agree to perform this contract in strict accordance with the General Provisions, and the following designated specifications, schedules, drawings, and conditions:

WORK SHALL BE STARTED	WORK SHALL BE COMPLETED

Alterations. The following alterations were made in this contract before it was signed by the parties hereto:

In witness whereof, the parties hereto have executed this contract as of the date entered on the first page hereof.

THE UNITED STATES OF AMERICA	CONTRACTOR
By _____	_____ (Name of Contractor)
_____ (Official title)	By _____ (Signature)
	_____ (Title)

INSTRUCTIONS

1. The full name and business address of the Contractor must be inserted in the space provided on the face of the form. The Contractor shall sign in the space provided above with his usual signature and typewrite or print his name under the signature.

2. An officer of a corporation, a member of a partnership, or an agent signing for the Contractor shall place his signature and title after the word "By" under the name of the Contractor. A contract executed by an attorney or agent on behalf of the Contractor shall be accompanied by two authenticated copies of his power of attorney or other evidence of his authority to act on behalf of the Contractor.

INDEX OF GENERAL PROVISIONS
(Construction Contract)

1.1. Definitions

1.2. Definitions

2. Specifications and Drawings

3. Changes

4. Differing Site Conditions

5. Termination for Default – Damages for Delay – Time Extensions

6. Disputes

7. Payments to Contractor

8. Assignment of Claims

9. Material and Workmanship

10. Inspection and Acceptance

11. Superintendence by Contractor

12. Permits and Responsibilities

13. Conditions Affecting the Work

14. Other Contracts

15. Shop Drawings

16. Use and Possession Prior to Completion

17. Suspension of Work

18. Termination for Convenience of the Government – Construction

19. Payment of Interest on Contractors' Claims

20. Pricing of Adjustments

21. Patent Indemnity

22. Additional Bond Security

23. Examination of Records by Comptroller General

24. Buy American Act

25. Equal Opportunity

26. Covenant Against Contingent Fees

27. Officials Not to Benefit

28. Convict Labor

29. Utilization of Small Business Concerns

30. Utilization of Minority Business Enterprises

31. Federal, State and Local Taxes

32. Davis–Bacon Act

33. Contract Work Hours and Safety Standards Act – Overtime Compensation

34. Apprentices and Trainees

35. Payrolls and Basic Records

36. Compliance with Copeland Regulations

37. Withholding of Funds

38. Subcontracts

39. Contract Termination – Debarment

40. Disputes Concerning Labor Standards

41. Contractor Inspection System

42. Gratuities

43. Small Business Subcontracting Program (Maintenance, Repair and Construction)

44. Renegotiation

45. Notice and Assistance Regarding Patent and Copyright Infringement

46. Authorization and Consent

47. Composition of Contractor

48. Site Investigation

49. Protection of Existing Vegetation, Structures, Utilities, and Improvements

50. Operations and Storage Areas

51. Modification Proposals – Price Breakdown

52. Subcontractors

53. Cleaning Up

54. Additional Definitions

55. Accident Prevention

56. Government Inspectors

57. Rights in Shop Drawings

58. Minority Business Enterprises Subcontracting Program

59. Affirmative Action for Disabled Veterans and Veterans of the Vietnam Era

60. Value Engineering Incentive

61. Affirmative Action for Handicapped Workers

62. Clean Air and Water

63. Notice to the Government of Labor Disputes

64. Contract Prices – Bidding Schedule

65. Priorities, Allocations, and Allotments

66. Price Reduction for Defective Cost of Pricing Data – Price Adjustments

67. Interest

68. Audit by Department of Defense

69. Subcontractor Cost or Pricing Data – Price Adjustments

70.1 Government–Furnished Property (Short Form)

70.2 Government Property (Fixed Price)

71. Variations in Estimated Quantities

72. Progress Charts and Requirements for Overtime Work

73. Environmental Litigation

74. Local Affirmative Action Plan

GENERAL PROVISIONS
(Construction Contract)
Issued By: Department of the Army, Corps of Engineers

(General Provisions 1 through 31 and 32 through 40 are those prescribed by the General Services Administration in Standard Form 23–A, April 1975 edition and Standard Form 19–A, November 1972 edition, respectively, as amended pursuant to the latest revisions of the Armed Services Procurement Regulation and Engineer Contract Instructions, ER 1180–1–1.)

1.1 DEFINITIONS

(The following clause is applicable if the procurement instrument identification number is prefixed by the letters "DACW")

(a) The term "head of the agency" or "Secretary" as used herein means the Secretary of the Army; and the term "his duly authorized representative" means the Chief of Engineers, Department of the Army, or an individual or board designated by him.

(b) The term "Contracting Officer" as used herein means the person executing this contract on behalf of the Government and includes a duly appointed successor or authorized representative. (ASPR 7–602.1 & ECI 7–070)

1.2 DEFINITIONS (1964 JUN)

(The following clause is applicable if the procurement instrument identification number is prefixed by the letters "DACA")

(a) The term "head of the agency" or "Secretary" as used herein means the Secretary, the Under Secretary, any Assistant Secretary, or any other head or assistant head of the executive or military department or other Federal agency; and the term "his duly authorized representative" means any person or persons or board (other than the Contracting Officer) authorized to act for the head of the agency or the Secretary.

(b) The term "Contracting Officer" as used herein means the person executing this contract on behalf of the Government and includes a duly appointed successor or authorized representative. (ASPR 7–602.1)

2. SPECIFICATIONS AND DRAWINGS (1964 JUN)

The Contractor shall keep on the work a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy either in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at his own risk and expense. The Contracting Officer shall furnish from time to time such detail drawings and other information as he may consider necessary, unless otherwise provided. (ASPR 7–602.2)

3. CHANGES (1968 FEB)

(a) The Contracting Officer may, at any time, without notice to the sureties, by written order designated or indicated to be a change order, make any change in the work within the general scope of the contract, including but not limited to changes:

(i) in the specifications (including drawings and designs);
(ii) in the method or manner of performance of the work;
(iii) in the Government–furnished facilities, equipment, materials, services, or site; or
(iv) directing acceleration in the performance of the work.

(b) Any other written order or an oral order (which terms as used in this paragraph (b) shall include direction, instruction, interpretation or determination) from the Contracting Officer, which causes any such change, shall be treated as a change order under this clause, *provided* that the Contractor gives the Contracting Officer written notice stating the date, circumstances, and source of the order and that the Contractor regards the order as a change order.

(c) Except as herein provided, no order, statement, or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment hereunder.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any order, an equitable adjustment shall be made and the contract modified in writing accordingly: *Provided, however,* That except for claims based on defective specifications, no claim for any change under (b) above shall be allowed for any costs incurred more than 20 days before the Contractor gives written notice as therein required: *And provided further,* That in the case of defective specifications for which the Government is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with such defective specifications.

(e) If the Contractor intends to assert a claim for an equitable adjustment under this clause, he must, within 30 days after receipt of a written change order under (a) above or the furnishing of a written notice under (b) above, submit to the Contracting Officer a written statement setting forth the general nature and monetary extent of such claim, unless this period is extended by the Government. The statement of claim hereunder may be included in the notice under (b) above.

(f) No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this contract. (ASPR 7–602.3)

4. DIFFERING SITE CONDITIONS (1968 FEB)

(a) The Contractor shall promptly, and before such conditions are disturbed, notify the Contracting Officer in writing of: (1) subsurface or latent physical conditions at the site differing materially from those indicated in this contract, or (2) unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in this contract. The Contracting Officer shall promptly investigate the conditions, and if he finds that such conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the work under this

contract, whether or not changed as a result of such conditions, an equitable adjustment shall be made and the contract modified in writing accordingly.

(b) No claim of the Contractor under this clause shall be allowed unless the Contractor has given the notice required in (a) above; *provided,* however, the time prescribed therefor may be extended by the Government.

(c) No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this contract. (ASPR 7–602.4)

5. TERMINATION FOR DEFAULT – DAMAGES FOR DELAY – TIME EXTENSIONS (1969 AUG)

(a) If the Contractor refuses or fails to prosecute the work, or any separable part thereof, with such diligence as will insure its completion within the time specified in this contract, or any extension thereof, or fails to complete said work within such time, the Government may, by written notice to the Contractor, terminate his right to proceed with the work or such part of the work as to which there has been delay. In such event the Government may take over the work and prosecute the same to completion, by contract or otherwise, and may take possession of and utilize in completing the work such materials, appliances, and plant as may be on the site of the work and necessary therefor. Whether or not the Contractor's right to proceed with the work is terminated, he and his sureties shall be liable for any damage to the Government resulting from his refusal or failure to complete the work within the specified time.

(b) If fixed and agreed liquidated damages are provided in the contract and if the Government so terminates the Contractor's right to proceed, the resulting damage will consist of such liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned the Government in completing the work.

(c) If fixed and agreed liquidated damages are provided in the contract and if the Government does not so terminate the Contractor's right to proceed, the resulting damage will consist of such liquidated damages until the work is completed or accepted.

(d) The Contractor's right to proceed shall not be so terminated nor the Contractor charged with resulting damage if:

(1) The delay in the completion of the work arises from causes other than normal weather beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, acts of the public enemy, acts of the Government in either its sovereign or contractual capacity, acts of another contractor in the performance of a contract with the Government, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather, or delays of subcontractors or suppliers arising from causes other than normal weather beyond the control and without the fault or negligence of both the Contractor and such subcontractors or suppliers; and

(2) The Contractor, within 10 days from the beginning of any such delay (unless the Contracting Officer grants a further period of time before the date of final payment under the contract), notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of the delay and extend the time for completing the work when, in his judgment, the findings of fact justify such an extension, and his findings of fact shall be final and conclusive on the parties, subject only to appeal as provided in the "Disputes" clause of this contract.

(e) If, after notice of termination of the Contractor's right to proceed under the provisions of this clause, it is determined for any reason that the Contractor was not in default under the provisions of this clause, or that the delay was excusable under the provisions of this clause, the rights and obligations of the parties shall, if the contract contains a clause providing for termination for convenience of the Government, be the same as if the notice of termination had been issued pursuant to such clause. If, in the foregoing circumstances, this contract does not contain a clause providing for termination for convenience of the Government, the contract shall be equitably adjusted to compensate for such termination and the contract modified accordingly; failure to agree to any such adjustment shall be a dispute concerning a question of fact within the meaning of the clause of this contract entitled "Disputes".

(f) The rights and remedies of the Government provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

(g) As used in paragraph (d)(1) of this clause, the term "subcontractors or suppliers" means subcontractors or suppliers at any tier. (ASPR 7–602.5)

6. DISPUTES (1964 JUN)

(a) Except as otherwise provided in this contract, any dispute concerning a question of fact arising under this contract which is not disposed of by agreement shall be decided by the Contracting Officer, who shall reduce his decision to writing and mail or otherwise furnish a copy thereof to the Contractor. The decision of the Contracting Officer shall be final and conclusive unless, within 30 days from the date of receipt of such copy, the Contractor mails or otherwise furnishes to the Contracting Officer a written appeal addressed to the head of the agency involved. The decision of the head of the agency or his duly authorized representative for the determination of such appeals shall be final and conclusive. This provision shall not be pleaded in any suit involving a question of fact arising under this contract as limiting judicial review of any such decision to cases where fraud by such official or his representative or board is alleged: *Provided, however,* that any such decision shall be final and conclusive unless the same is fraudulent or capricious or arbitrary or so grossly erroneous as necessarily to imply bad faith or is not supported by substantial evidence. In connection with any appeal proceeding under this clause, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of his appeal. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the contract and in accordance with the Contracting Officer's decision.

(b) This "Disputes" clause does not preclude consideration of questions of law in connection with decisions provided for in paragraph (a) above. Nothing in this contract, however, shall be construed as making final the decision of any administrative official, representative, or board on a question of law. (ASPR 7–602.6(a))

7. PAYMENTS TO CONTRACTOR (1976 MAR)

(a) The Government will pay the contract price as hereinafter provided.

(b) The Government will make progress payments monthly as the work proceeds, or at more frequent intervals as determined by the Contracting Officer, on estimates approved by the Contracting Officer. If requested by the Contracting Officer, the Contractor shall furnish a breakdown of the total contract price showing the amount included therein for each principal category of the work, in

such detail as requested, to provide a basis for determining progress payments. In the preparation of estimates the Contracting Officer, at his discretion, may authorize material delivered on the site and preparatory work done to be taken into consideration. Material delivered to the Contractor at locations other than the site may also be taken into consideration (1) if such consideration is specifically authorized by the contract and (2) if the Contractor furnishes satisfactory evidence that he has acquired title to such material and that it will be utilized on the work covered by this contract.

(c) In making such progress payments, there shall be retained 10 percent of the estimated amount until final completion and acceptance of the contract work. However, if the Contracting Officer finds that satisfactory progress was achieved during any period for which a progress payment is to be made, he may authorize such payment to be made in full without retention of a percentage. Also, whenever the work is substantially complete, the Contracting Officer shall retain an amount he considers adequate for the protection of the Government, and, at his discretion, may release to the Contractor all or a portion of any excess amount. Furthermore, on completion and acceptance of each separate building, public work, or other division of the contract, on which the price is stated separately in the contract, payment may be made therefor without retention of a percentage.

(d) All material and work covered by progress payments made shall thereupon become the sole property of the Government, but this provision shall not be construed as relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work, or as waiving the right of the Government to require the fulfillment of all of the terms of the contract.

(e) Upon completion and acceptance of all work, the amount due the Contractor under this contract shall be paid upon the presentation of a properly executed voucher and after the Contractor shall have furnished the Government with a release of all claims against the Government arising by virtue of this contract, other than claims in stated amounts as may be specifically excepted by the Contractor from the operation of the release. If the Contractor's claim to amounts payable under the contract has been assigned under the Assignment of Claims Act of 1940, as amended (31 U.S.C. 203, 41 U.S.C. 15), a release may also be required of the assignee. (ASPR 7–602.7)

8. ASSIGNMENT OF CLAIMS (1976 OCT)

(a) Pursuant to the provisions of the Assignment of Claims Act of 1940, as amended (31 U.S.C. 203, 41 U.S.C. 15), if this contract provides for payments aggregating $1,000 or more, claims for moneys due or to become due the Contractor from the Government under this contract may be assigned to a bank, trust company, or other financing institution, including any Federal lending agency, and may thereafter be further assigned and reassigned to any such institution. Any such assignment or reassignment shall cover all amounts payable under this contract and not already paid, and shall not be made to more than one party, except that any such assignment or reassignment may be made to one party as agent or trustee for two or more parties participating in such financing. Unless otherwise provided in this contract, payments to assignee of any moneys due or to become due under this contract shall not, to the extent provided in said Act, as amended, be subject to reduction or setoff. (The preceding sentence applies only if this contract is made in time of war or national emergency as defined in said Act and is with the Department of Defense, the General Services Administration, the Energy Research and Development Administration, the National Aeronautics and Space Administration, the Federal Aviation Administration, or any other department or agency of the United States designated by the President pursuant to Clause 4 of the proviso of section 1 of the Assignment of Claims Act of 1940, as amended by the Act of May 15, 1951, 65 Stat. 41.)

(b) In no event shall copies of this contract or of any plans, specifications, or other similar documents relating to work under this contract, if marked "Top Secret," "Secret," or "Confidential," be furnished to any assignee of any claim arising under this contract or to any other person not entitled to receive the same. However, a copy of any part or all of this contract so marked may be furnished, or any information contained therein may be disclosed, to such assignee upon the prior written authorization of the Contracting Officer. (ASPR 7–602.8)

9. MATERIAL AND WORKMANSHIP (1964 JUN)

(a) Unless otherwise specifically provided in this contract, all equipment, material, and articles incorporated in the work covered by this contract are to be new and of the most suitable grade for the purpose intended. Unless otherwise specifically provided in this contract, reference to any equipment, material, article, or patented process, by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition, and the Contractor may, at his option, use any equipment, material, article, or process which, in the judgment of the Contracting Officer, is equal to that named. The Contractor shall furnish to the Contracting Officer for his approval the name of the manufacturer, the model number, and other identifying data and information respecting the performance, capacity, nature, and rating of the machinery and mechanical and other equipment which the Contractor contemplates incorporating in the work. When required by this contract or when called for by the Contracting Officer, the Contractor shall furnish the Contracting Officer for approval full information concerning the material or articles which he contemplates incorporating in the work. When so directed, samples shall be submitted for approval at the Contractor's expense, with all shipping charges prepaid. Machinery, equipment, material, and articles installed or used without required approval shall be at the risk of subsequent rejection.

(b) All work under this contract shall be performed in a skillful and workmanlike manner. The Contracting Officer may, in writing, require the Contractor to remove from the work any employee the Contracting Officer deems incompetent, careless, or otherwise objectionable. (ASPR 7–602.9)

10. INSPECTION AND ACCEPTANCE (1976 OCT)

(a) All work (which term includes but is not restricted to materials, workmanship, and manufacture and fabrication of components) shall be subject to inspection and test by the Government at all reasonable times and at all places prior to acceptance. Any such inspection and test is for the sole benefit of the Government and shall not relieve the Contractor of the responsibility of providing quality control measures to assure that the work strictly complies with the contract requirements. No inspection or test by the Government shall be construed as constituting or implying acceptance. Inspection or test shall not relieve the Contractor of responsibility for damage to or loss of

the material prior to acceptance, nor in any way affect the continuing rights of the Government after acceptance of the completed work under the terms of paragraph (f) of this clause, except as hereinabove provided.

(b) The Contractor shall, without charge, replace any material or correct any workmanship found by the Government not to conform to the contract requirements, unless in the public interest the Government consents to accept such material or workmanship with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.

(c) If the Contractor does not promptly replace rejected material or correct rejected workmanship, the Government (1) may, by contract or otherwise, replace such material or correct such workmanship and charge the cost thereof to the Contractor, or (2) may terminate the Contractor's right to proceed in accordance with the clause of this contract entitled "Termination for Default – Damages for Delay – Time Extensions."

(d) The Contractor shall furnish promptly, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspection and test as may be required by the Contracting Officer. All inspection and test by the Government shall be performed in such manner as not unnecessarily to delay the work. Special, full size, and performance tests shall be performed as described in this contract. The Government reserves the right to charge to the Contractor any additional cost of inspection or test when material or workmanship is not ready at the time specified by the Contractor for inspection or test or when reinspection or retest is necessitated by prior rejection.

(e) Should it be considered necessary or advisable by the Government at any time before acceptance of the entire work to make an examination of work already completed, by removing or tearing out same, the Contractor shall, on request, promptly furnish all necessary facilities, labor and material. If such work is found to be defective or nonconforming in any material respect, due to the fault of the Contractor or his subcontractors, he shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, an equitable adjustment shall be made in the contract price to compensate the Contractor for the additional services involved in such examination and reconstruction and, if completion of the work has been delayed thereby, he shall, in addition, be granted a suitable extension of time.

(f) Unless otherwise provided in this contract, acceptance by the Government shall be made as promptly as practicable after completion and inspection of all work required by this contract, or that portion of the work that the Contracting Officer determines can be accepted separately. Acceptance shall be final and conclusive except as regards latent defects, fraud, or such gross mistakes as may amount to fraud or as regards the Government's rights under any warranty or guarantee. (ASPR 7–602.11)

11. SUPERINTENDENCE BY CONTRACTOR (1976 OCT)

The Contractor, at all times during performance and until the work is completed and accepted, shall give his personal superintendence to the work or have on the work a competent superintendent, satisfactory to the Contracting Officer and with authority to act for the Contractor. (ASPR 7–602.12)

12. PERMITS AND RESPONSIBILITIES (1964 JUN)

The Contractor shall, without additional expense to the Government, be responsible for obtaining any necessary licenses and permits, and for complying with any applicable Federal, State, and municipal laws, codes, and regulations, in connection with the prosecution of the work. He shall be similarly responsible for all damages to persons or property that occur as a result of his fault or negligence. He shall take proper safety and health precautions to protect the work the workers, the public, and the property of others. He shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire construction work, except for any completed unit of construction thereof which theretofore may have been accepted. (ASPR 7–602.13)

13. CONDITIONS AFFECTING THE WORK (1964 JUN)

The Contractor shall be responsible for having taken steps reasonably necessary to ascertain the nature and location of the work and the general and local conditions which can affect the work or the cost thereof. Any failure by the Contractor to do so will not relieve him from responsibility for successfully performing the work without additional expense to the Government. The Government assumes no responsibility for any understanding or representations concerning conditions made by any of its officers or agents prior to the execution of this contract, unless such understanding or representations by the Government are expressly stated in the contract. (ASPR 7–602.14)

14. OTHER CONTRACTS (1964 JUN)

The Government may undertake or award other contracts for additional work and the Contractor shall fully cooperate with such other contractors and Government employees and carefully fit his own work to such additional work as may be directed by the Contracting Officer. The Contractor shall not commit or permit any act which will interfere with the performance of work by any other contractor or by Government employees. (ASPR 7–602.15)

15. SHOP DRAWINGS (1976 OCT)

(a) The term *"shop drawings"* includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data; and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the contract.

(b) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with contract requirements and shall indicate his approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate his approval or disapproval of the shop drawings and if not approved as submitted shall indicate his reasons therefor. Any work done prior to such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (c) below.

(c) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Contracting Officer approves any such variation(s), he shall issue an appropriate contract

modification, except that, if the variation is minor and does not involve a change in price or in time of performance, a modification need not be issued.

(d) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated herein) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated herein) of all shop drawings will be retained by the Contracting Officer and one set will be returned to the Contractor. (ASPR 7–602.54(a))

16. USE AND POSSESSION PRIOR TO COMPLETION (1976 OCT)

The Government shall have the right to take possession of or use any completed or partially completed part of the work. Prior to such possession or use, the Contracting Officer shall furnish the Contractor an itemized list of work remaining to be performed or corrected on such portions of the project as are to be possessed or used by the Government, *provided* that failure to list any item of work shall not relieve the Contractor of responsibility for compliance with the terms of the contract. Such possession or use shall not be deemed an acceptance of any work under the contract. While the Government has such possession or use, the Contractor, notwithstanding the provisions of the clause of this contract entitled "Permits and Responsibilities," shall be relieved of the responsibility for the loss or damage to the work resulting from the Government's possession or use. If such prior possession or use by the Government delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment in the contract price or the time of completion will be made and the contract shall be modified in writing accordingly. (ASPR 7–602.39)

17. SUSPENSION OF WORK (1968 FEB)

(a) The Contracting Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as he may determine to be appropriate for the convenience of the Government.

(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted by an act of the Contracting Officer in the administration of this contract, or by his failure to act within the time specified in this contract (or if no time is specified, within a reasonable time), an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent (1) that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor or (2) for which an equitable adjustment is provided for or excluded under any other provision of this contract.

(c) No claim under this clause shall be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of such suspension, delay, or interruption, but not later than the date of final payment under the contract. (ASPR 7–602.46)

18. TERMINATION FOR CONVENIENCE OF THE GOVERNMENT–CONSTRUCTION (1974 APR)

(a) The performance of work under this contract may be terminated by the Government in accordance with this clause in whole, or from time to time in part, whenever the Contracting Officer shall determine that such termination is in the best interest of the Government. Any such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which performance of work under the contract is terminated, and the date upon which such termination becomes effective.

(b) After receipt of a Notice of Termination, and except as otherwise directed by the Contracting Officer, the Contractor shall:

(i) stop work under the contract on the date and to the extent specified in the Notice of Termination;

(ii) place no further orders or subcontracts for materials, services or facilities, except as may be necessary for completion of such portion of the work under the contract as is not terminated;

(iii) terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the Notice of Termination;

(iv) assign to the Government, in the manner, at the times, and to the extent directed by the Contracting Officer, all of the right, title, and interest of the Contractor under the orders and subcontracts so terminated, in which case the Government shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;

(v) settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, with the approval or ratification of the Contracting Officer, to the extent he may require, which approval or ratification shall be final for all the purposes of this clause;

(vi) transfer title and deliver to the Government, in the manner, at the times, and to the extent, if any, directed by the Contracting Officer, (A) the fabricated or unfabricated parts, work in process, completed work supplies, and other material produced as a part of, or acquired in connection with the performance of, the work terminated by the Notice of Termination, and (B) the completed or partially completed plans, drawings, information, and other property which, if the contract had been completed, would have been required to be furnished to the Government;

(vii) use his best efforts to sell, in the manner, at the times, to the extent, and at the price or prices directed or authorized by the Contracting Officer, any property of the types referred to in (vi) above; *provided*, however, that the Contractor (A) shall not be required to extend credit to any purchaser, and (B) may acquire any such property under the conditions prescribed by and at a

price or prices approved by the Contracting Officer; and *provided further* that the proceeds of any such transfer or disposition shall be applied in reduction of any payments to be made by the Government to the Contractor under this contract or shall otherwise be credited to the price or cost of the work covered by this contract or paid in such other manner as the Contracting Officer may direct;

(viii) complete performance of such part of the work as shall not have been terminated by the Notice of Termination; and

(ix) take such action as may be necessary, or as the Contracting Officer may direct, for the protection and preservation of the property related to this contract which is in the possession of the Contractor and in which the Government has or may acquire an interest.

At any time after expiration of the plant clearance period, as defined in Section VIII, Armed Services Procurement Regulation, as it may be amended from time to time, the Contractor may submit to the Contracting Officer a list, certified as to quantity and quality, of any or all items of termination inventory not previously disposed of, exclusive of items the disposition of which has been directed or authorized by the Contracting Officer, and may request the Government to remove such items or enter into a storage agreement covering them. Not later than fifteen (15) days thereafter, the Government will accept title to such items and remove them or enter into a storage agreement covering the same; *provided,* that the list submitted shall be subject to verification by the Contracting Officer upon removal of the items, or if the items are stored, within forty-five (45) days from the date of submission of the list, and any necessary adjustment to correct the list as submitted shall be made prior to final settlement.

(c) After receipt of a Notice of Termination, the Contractor shall submit to the Contracting Officer his termination claim, in the form and with certification prescribed by the Contracting Officer. Such claim shall be submitted promptly but in no event later than one year from the effective date of termination, unless one or more extensions in writing are granted by the Contracting Officer, upon request of the Contractor made in writing within such one year period or authorized extension thereof. However, if the Contracting Officer determines that the facts justify such action, he may receive and act upon any such termination claim at any time after such one year period or any extension thereof. Upon failure of the Contractor to submit his termination claim within the time allowed, the Contracting Officer may determine, on the basis of information available to him, the amount, if any, due to the Contractor by reason of the termination and shall thereupon pay to the Contractor the amount so determined.

(d) Subject to the provisions of paragraph (c), the Contractor and the Contracting Officer may agree upon the whole or any part of the amount or amounts to be paid to the Contractor by reason of the total or partial termination of work pursuant to this clause, which amount or amounts may include a reasonable allowance for profit on work done; *provided,* that such agreed amount or amounts, exclusive of settlement costs, shall not exceed the total contract price as reduced by the amount of payments otherwise made and as further reduced by the contract price of work not terminated. The contract shall be amended accordingly, and the Contractor shall be paid the agreed amount. Nothing in paragraph (e) of this clause, prescribing the amount to be paid to the Contractor in the event of failure of the Contractor and the Contracting Oficer to agree upon the whole amount to be paid to the Contractor by reason of the termination of work pursuant to this clause, shall be deemed to limit, restrict, or otherwise determine or affect the amount or amounts which may be agreed upon to be paid to the Contractor pursuant to this paragraph (d).

(e) In the event of the failure of the Contractor and the Contracting Officer to agree, as provided in paragraph (d), upon the whole amount to be paid to the Contractor by reason of the termination of work pursuant to this clause, the Contracting Officer shall pay to the Contractor the amounts determined by the Contracting Officer as follows, but without duplication of any amounts agreed upon in accordance with paragraph (d):

(i) with respect to all contract work performed prior to the effective date of the Notice of Termination, the total (without duplication of any items) of–

(A) the cost of such work;

(B) the cost of settling and paying claims arising out of the termination of work under subcontracts or orders as provided in paragraph (b)(v) above, exclusive of the amounts paid or payable on account of supplies or materials delivered or services furnished by the subcontractor prior to the effective date of the Notice of Termination of Work under this contract, which amounts shall be included in the cost on account of which payment is made under (A) above; and

(C) a sum, as profit on (A) above, determined by the Contracting Officer pursuant to 8–303 of the Armed Services Procurement Regulation, in effect as of the date of execution of this contract, to be fair and reasonable; *provided,* however, that if it appears that the Contractor would have sustained a loss on the entire contract had it been completed, no profit shall be included or allowed under this subdivision (C) and an appropriate adjustment shall be made reducing the amount of the settlement to reflect the indicated rate of loss; and

(ii) the reasonable cost of the preservation and protection of property incurred pursuant to paragraph (b)(ix); and any other reasonable cost incidental to termination of work under this contract, including expense incidental to the determination of the amount due to the Contractor as the result of the termination of work under this contract.

The total sum to be paid to the Contractor under (i) above shall not exceed the total contract price as reduced by the amount of payments otherwise made and as further reduced by the contract price of work not terminated. Except for normal spoilage, and except to the extent that the Government shall have otherwise expressly assumed the

risk of loss, there shall be excluded from the amounts payable to the Contractor under (i) above, the fair value, as determined by the Contracting Officer, of property which is destroyed, lost, stolen, or damaged so as to become undeliverable to the Government, or to a buyer pursuant to paragraph (b)(vii).

(f) Costs claimed, agreed to, or determined pursuant to (c), (d), (e), and (i) hereof shall be in accordance with Section XV of the Armed Services Procurement Regulation as in effect on the date of this contract.

(g) The Contractor shall have the right of appeal, under the clause of this contract entitled "Disputes", from any determination made by the Contracting Officer under paragraph (c), (e), or (i) hereof, except that if the Contractor has failed to submit his claim within the time provided in paragraph (c) or (i) hereof, and has failed to request extension of such time, he shall have no such right of appeal. In any case where the Contracting Officer has made a determination of the amount due under paragraph (c), (e) or (i) hereof, the Government shall pay to the Contractor the following: (i) if there is no right of appeal hereunder or if no timely appeal has been taken, the amount so determined by the Contracting Officer, or (ii) if an appeal has been taken, the amount finally determined on such appeal.

(h) In arriving at the amount due the Contractor under this clause there shall be deducted (i) all unliquidated advance or other payments on account theretofore made to the Contractor, applicable to the terminated portion of this contract, (ii) any claim which the Government may have against the Contractor in connection with this contract, and (iii) the agreed price for, or the proceeds of sale of, any materials, supplies, or other things acquired by the Contractor or sold, pursuant to the provisions of this clause, and not otherwise recovered by or credited to the Government.

(i) If the termination hereunder be partial, the Contractor may file with the Contracting Officer a claim for an equitable adjustment of the price or prices specified in the contract relating to the continued portion of the contract (the portion not terminated by the Notice of Termination), and such equitable adjustment as may be agreed upon shall be made in such price or prices. Any claim by the Contractor for an equitable adjustment under this clause must be asserted within ninety (90) days from the effective date of the termination notice, unless an extension is granted in writing by the Contracting Officer.

(j) The Government may from time to time, under such terms and conditions as it may prescribe, make partial payments and payments on account against costs incurred by the Contractor in connection with the terminated portion of this contract whenever in the opinion of the Contracting Officer the aggregate of such payments shall be within the amount to which the Contractor will be entitled hereunder. If the total of such payments is in excess of the amount finally agreed or determined to be due under this clause, such excess shall be payable by the Contractor to the Government upon demand, together with interest computed at the rate established by the Secretary of the Treasury pursuant to Public Law 92–41, 85 STAT 97 for the Renegotiation Board, for the period from the date such excess payment is received by the Contractor to the date on which such excess is repaid to the Government; *provided*, however, that no interest shall be charged with respect to any such excess payment attributable to a reduction in the Contractor's claim by reason of retention or other disposition of termination inventory until ten days after the date of such retention or disposition, or such later date as determined by the Contracting Officer by reason of the circumstances.

(k) Unless otherwise provided for in this contract, or by applicable statute, the Contractor shall – from the effective date of termination until the expiration of three years after final settlement under this contract – preserve and make available to the Government at all reasonable times at the office of the Contractor but without direct charge to the Government, all his books, records, documents and other evidence bearing on the costs and expenses of the Contractor under this contract and relating to the work terminated hereunder, or, to the extent approved by the Contracting Officer, photographs, microphotographs, or other authentic reproductions thereof. (ASPR 7–602.29(a))

19. PAYMENT OF INTEREST ON CONTRACTORS' CLAIMS (1976 JUL)

(a) If an appeal is filed by the Contractor from a final decision of the Contracting Officer under the "Disputes" clause of this contract, denying a claim arising under the contract, simple interest on the amount of the claim finally determined owed by the Government shall be payable to the Contractor. Such interest shall be at the rate established by the Secretary of the Treasury pursuant to Public Law 92–41; 85 STAT 97, from the date the Contractor furnishes to the Contracting Officer his written appeal under the "Disputes" clause of this contract, to the date of (i) a final judgment by a court of competent jurisdiction, or (ii) mailing to the Contractor of a supplemental agreement for execution either confirming completed negotiations between the parties or carrying out a decision of a board of contract appeals.

(b) Notwithstanding (a) above, (i) interest shall be applied only from the date payment was due, if such date is later than the filing of appeal; and (ii) interest shall not be paid for any period of time that the Contracting Officer determines the Contractor has unduly delayed in pursuing his remedies before a board of contract appeals or a court of competent jurisdiction. (ASPR 7–104.82)

20. PRICING OF ADJUSTMENTS (1970 JUL)

When costs are a factor in any determination of a contract price adjustment pursuant to the "Changes" clause or any other provision of this contract, such costs shall be in accordance with Section XV of the Armed Services Procurement Regulation as in effect on the date of this contract. (ASPR 7–103.26)

21. PATENT INDEMNITY (1964 JUN)

Except as otherwise provided, the Contractor agrees to indemnify the Government and its officers, agents, and employees against liability, including costs and expenses, for infringement upon any Letters Patent of the United States (except Letters Patent issued upon an application which is now or may hereafter be, for reasons of national security, ordered by the Government to be kept secret or otherwise withheld from issue) arising out of the performance of this contract or out of the use or disposal by or for the account of the Government of supplies furnished or construction work performed hereunder. (ASPR 7–602.16(a))

22. ADDITIONAL BOND SECURITY (1976 OCT)

If any surety upon any bond furnished in connection with this contract becomes unacceptable to the Government, or if any such surety fails to furnish reports as to his financial condition from time to time as requested by the Government, or if the contract price is increased to such an extent that the penal sum of any bond becomes

inadequate in the opinion of the Contracting Officer, the Contractor shall promptly furnish such additional security as may be required from time to time to protect the interests of the Government and of persons supplying labor or materials in the prosecution of the work contemplated by this contract. (ASPR 7-602.17)

23. EXAMINATION OF RECORDS BY COMPTROLLER GENERAL (1975 JUN)

(a) This clause is applicable if the amount of this contract exceeds $10,000 and was entered into by means of negotiation, including small business restricted advertising but is not applicable if this contract was entered into by means of formal advertising.

(b) The Contractor agrees that the Comptroller General of the United States or any of his duly authorized representatives shall, until the expiration of three years after final payment under this contract or such lesser time specified in either Appendix M of the Armed Services Procurement Regulation or the Federal Procurement Regulations Part 1-20, as appropriate, have access to and the right to examine any directly pertinent books, documents, papers, and records of the Contractor involving transactions related to this contract.

(c) The Contractor further agrees to include in all his subcontracts hereunder a provision to the effect that the subcontractor agrees that the Comptroller General of the United States or any of his duly authorized representatives shall, until the expiration of three years after final payment under the subcontract or such lesser time specified in either Appendix M of the Armed Services Procurement Regulation or the Federal Procurement Regulations Part 1-20, as appropriate, have access to and the right to examine any directly pertinent books, documents, papers, and records of such subcontractor, involving transactions related to the subcontract. The term "subcontract" as used in this clause excludes (i) purchase orders not exceeding $10,000 and (ii) subcontracts or purchase orders for public utility services at rates established for uniform applicability to the general public.

(d) The periods of access and examination described in (b) and (c) above for records which relate to (i) appeals under the "Disputes" clause of this contract, (ii) litigation or the settlement of claims arising out of the performance of this contract, or (iii) costs and expenses of this contract as to which exception has been taken by the Comptroller General or any of his duly authorized representatives, shall continue until such appeals, litigation, claims or exceptions have been disposed of. (ASPR 7-104.15)

24. BUY AMERICAN ACT (1966 OCT)

(a) *Agreement.* In accordance with the Buy American Act (41 U.S.C. 10a-10d), the Contractor agrees that only domestic construction material will be used (by the Contractor, subcontractors, materialmen, and suppliers) in the performance of this contract, except for nondomestic construction material listed in the "Nondomestic Construction Materials" clause, if any, of this contract.

(b) *Domestic construction material.* "Construction material" means any article, material, or supply brought to the construction site for incorporation in the building or work 'An unmanufactured construction material is a "domestic construction material" if it has been mined or produced in the United States. A manufactured construction material is a "domestic construction material" if it has been manufactured in the United States and if the cost of its components which have been mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. "Component" means any article, material, or supply directly incorporated in a construction material.

(c) *Domestic component.* A component shall be considered to have been "mined, produced, or manufactured in the United States" (regardless of its source in fact) if the article, material, or supply in which it is incorporated was manufactured in the United States and the component is of a class or kind determined by the Government to be not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities and of a satisfactory quality. (ASPR 7-602.20)

25. EQUAL OPPORTUNITY (1976 JUL)

(The following clause is not applicable if this contract is exempt under ASPR 12-805. Exemptions include contracts and subcontracts not exceeding $10,000, and work under contracts and subcontracts which is to be performed outside the United States by employees who were not recruited within the United States. The requirements of paragraph (3) of the clause shall be satisfied whenever the prime contractor or subcontractor posts copies of the notification prescribed by or pursuant to paragraph (1) of the clause (ASPR 12-804(e)(2).)

During the performance of this contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include but not be limited to the following: Employment, upgrading, demotion, or transfer, recruitment or recruitment advertising: layoff or termination, rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this Equal Opportunity clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(3) The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding a notice to be provided by the agency Contracting Officer, advising the labor union or workers' representative of the contractor's commitments under this Equal Opportunity clause and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The Contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, and by the rules, regulations, and orders of the Secretary of Labor or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations and orders.

(6) In the event of the Contractor's noncompliance with the Equal Opportunity clause of this contract or with any of the said rules, regulations, or orders, this contract

may be canceled, terminated or suspended in whole or in part, and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965 as amended by Executive Order No. 11375 of October 13, 1967, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The Contractor will include the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions including sanctions for noncompliance: *Provided,* however, that in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States. (ASPR 7–103.18(a))

26. COVENANT AGAINST CONTINGENT FEES (1958 JAN)

The contractor warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Contractor for the purpose of securing business. For breach or violation of this warranty the Government shall have the right to annul this contract without liability or in its discretion, to deduct from the contract price or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage or contingent fee. (ASPR 7–103.20)

27. OFFICIALS NOT TO BENEFIT (1949 JUL)

No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this contract, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit. (ASPR 7–103.19)

28. CONVICT LABOR (1975 OCT)

In connection with the performance of work under this contract, the Contractor agrees not to employ any person undergoing sentence of imprisonment except as provided by Public Law 89–176, September 10, 1965 (18 U.S.C. 4082(c)(2)) and Executive Order 11755, December 29, 1973. (ASPR 7–104.17)

29. UTILIZATION OF SMALL BUSINESS CONCERNS (1958 JAN)

(a) It is the policy of the Government as declared by the Congress that a fair proportion of the purchases and contracts for supplies and services for the Government be placed with small business concerns.

(b) The Contractor agrees to accomplish the maximum amount of subcontracting to small business concerns that the Contractor finds to be consistent with the efficient performance of this contract. (ASPR 7–104.14(a))

30. UTILIZATION OF MINORITY BUSINESS ENTERPRISES (1971 NOV)

(a) It is the policy of the Government that Minority Business Enterprises shall have the maximum practicable opportunity to participate in the performance of Government contracts.

(b) The Contractor agrees to use his best efforts to carry out this policy in the award of his subcontracts to the fullest extent consistent with the efficient performance of this contract. As used in this contract, the term "minority business enterprise" means a business, at least 50 percent of which is owned by minority group members or, in case of publicly–owned businesses, at least 51 percent of the stock of which is owned by minority group members. For the purposes of this definition, minority group members are Negroes, Spanish–speaking American persons, American–Orientals, American–Indians, American Eskimos, and American Aleuts. Contractors may rely on written representations by subcontractors regarding their status as minority business enterprises in lieu of an independent investigation. (ASPR 7–104.36(a))

31. FEDERAL, STATE, AND LOCAL TAXES (1971 NOV)

(a) Except as may be otherwise provided in this contract, the contract price includes all applicable Federal, State, and local taxes and duties.

(b) Nevertheless, with respect to any Federal excise tax or duty on the transactions or property covered by this contract, if a statute, court decision, written ruling, or regulation takes effect after the contract date, and –

(1) results in the Contractor being required to pay or bear the burden of any such Federal excise tax or duty or increase in the rate thereof which would not otherwise have been payable on such transactions or property, the contract price shall be increased by the amount of such tax or duty or rate increase, *provided* the Contractor warrants in writing that no amount for such newly imposed Federal excise tax or duty or rate increase was included in the contract price as a contingency reserve or otherwise; or

(2) results in the Contractor not being required to pay or bear the burden of, or in his obtaining a refund or drawback of, any such Federal excise tax or duty which would otherwise have been payable on such transactions or property or which was the basis of an increase in the contract price, the contract price shall be decreased by the amount of the relief, refund, or drawback or that amount shall be paid to the Government, as directed by the Contracting Officer. The contract price shall be similarly decreased if the Contractor, through his fault or negligence or his failure to follow instructions of the Contracting Officer, is required to pay or bear the burden of, or does not obtain a refund or drawback of, any such Federal excise tax or duty.

(c) Paragraph (b) above shall not be applicable to social security taxes or to any other employment tax.

(d) No adjustment of less than $100 shall be made in the contract price pursuant to paragraph (b) above.

(e) As used in paragraph (b) above, the term "contract date" means the date set for bid opening, or if this is a negotiated contract, the contract date. As to additional supplies or services procured by modification to this contract, the term "contract date" means the date of such modification.

(f) Unless there does not exist any reasonable basis to sustain an exemption, the Government upon the

request of the Contractor shall, without further liability, furnish evidence appropriate to establish exemption from any Federal, State, or local tax; *provided* that, evidence appropriate to establish exemption from any Federal excise tax or duty which may give rise to either an increase or decrease in the contract price will be furnished only at the discretion of the Government.

(g) The Contractor shall promptly notify the Contracting Officer of matters which will result in either an increase or decrease in the contract price and shall take action with respect thereto as directed by the Contracting Officer. (ASPR 7-103.10(a))

32. DAVIS-BACON ACT (40 U.S.C. 276a-276a-7)

(a) All mechanics and laborers, including apprentices and trainees, employed or working directly upon the site of the work shall be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Copeland Regulations, 29 CFR Part 3), the full amounts due at time of payment computed at wage rates not less than the aggregate of the basic hourly rates and the rates of payments, contributions, or costs for any fringe benefits contained in the wage determination decision of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor or subcontractor and such laborers and mechanics. A copy of such wage determination decision shall be kept posted by the Contractor at the site of the work in a prominent place where it can be easily seen by the workers.

(b) The Contractor may discharge his obligation under this clause to workers in any classification for which the wage determination decision contains:

(1) Only a basic hourly rate of pay, by making payment at not less than such basic hourly rate, except as otherwise provided in the Copeland Regulations. (29 CFR Part 3); or

(2) Both a basic hourly rate of pay and fringe benefits payments, by making payment in cash, by irrevocably making contributions pursuant to a fund, plan, or program for, and/or by assuming an enforceable commitment to bear the cost of, bona fide fringe benefits contemplated by the Davis-Bacon Act, or by any combination thereof. Contributions made, or costs assumed, on other than a weekly basis shall be considered as having been constructively made or assumed during a weekly period to the extent that they apply to such period. Where a fringe benefit is expressed in a wage determination in any manner other than as an hourly rate and the Contractor pays a cash equivalent or provides an alternative fringe benefit, he shall furnish information with his payrolls showing how he determined that the cost incurred to make the cash payment or to provide the alternative fringe benefit is equal to the cost of the wage determination fringe benefit. In any case where the Contractor provides a fringe benefit different from any contained in the wage determination, he shall similarly show how he arrived at the hourly rate shown therefor. In the event of disagreement between or among the interested parties as to an equivalent of any fringe benefit, the Contracting Officer shall submit the question, together with his recommendation, to the Secretary of Labor for final determination.

(c) The assumption of an enforceable commitment to bear the cost of fringe benefits, or the provision of any fringe benefits not expressly listed in section 1(b)(2) of the Davis-Bacon Act or in the wage determination decision forming a part of the contract, may be considered as payment of wages only with the approval of the Secretary of Labor pursuant to a written request by the Contractor. The Secretary of Labor may require the Contractor to set aside assets, in a separate account, to meet his obligations under any unfunded plan or program.

(d) The Contracting Officer shall require that any class of laborers or mechanics, including apprentices and trainees, which is not listed in the wage determination decision and which is to be employed under the contract shall be classified or reclassified conformably to the wage determination decision, and shall report the action taken to the Secretary of Labor. If the interested parties cannot agree on the proper classification or reclassification of a particular class of laborers or mechanics to be used, the Contracting Officer shall submit the question, together with his recommendation, to the Secretary of Labor for final determination. Apprentices and trainees may be added under this clause only where they are employed pursuant to an apprenticeship or trainee program meeting the requirements of the Apprentices and Trainees clause below.

(e) In the event it is found by the Contracting Officer that any laborer or mechanic, including apprentices and trainees, employed by the Contractor or any subcontractor directly on the site of the work covered by this contract has been or is being paid at a rate of wages less than the rate of wages required by paragraph (a) of this clause, the Contracting Officer may (1) by written notice to the Government Prime Contractor terminate his right to proceed with the work, or such part of the work as to which there has been a failure to pay said required wages, and (2) prosecute the work to completion by contract or otherwise, whereupon such Contractor and Subcontractor and his sureties shall be liable to the Government for any excess costs occasioned the Government thereby.

(f) Paragraphs (a) through (e) of the clause shall apply to this contract to the extent that it is (1) a prime contract with the Government subject to the Davis-Bacon Act or (2) a subcontract also subject to the Davis-Bacon Act under such prime contract.

33. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT - OVERTIME COMPENSATION (40 U.S.C. 327-333)

This contract is subject to the Contract Work Hours and Safety Standards Act and to the applicable rules, regulations, and interpretations of the Secretary of Labor.

(a) The Contractor shall not require or permit any laborer or mechanic, including apprentices, trainees, watchmen, and guards, in any workweek in which he is employed on any work under this contract to work in excess of 8 hours in any calendar day or in excess of 40 hours in such workweek on work subject to the provisions of the Contract Work Hours and Safety Standards Act unless such laborer or mechanic, including apprentices, trainees, watchmen, and guards, receives compensation at a rate not less than 1½ times his basic rate of pay for all such hours worked in excess of 8 hours in any calendar day or in excess of 40 hours in such workweek, whichever is the greater number of overtime hours. The "basic rate of pay," as used in this clause, shall be the amount paid per hour exclusive of the Contractor's contribution or cost for fringe benefits, and any cash payment made in lieu of providing fringe benefits, or the basic hourly rate contained in the wage determination, whichever is greater.

(b) In the event of any violation of the provisions of paragraph (a), the Contractor shall be liable to any affected employee for any amounts due, and to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including an apprentice, trainee, watchman, or

guard, employed in violation of the provisions of paragraph (a) in the sum of $10 for each calendar day on which such employee was required or permitted to be employed on such work in excess of 8 hours or in excess of the standard workweek of 40 hours without payment of the overtime wages required by paragraph (a).

34. APPRENTICES AND TRAINEES

(a) Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training, or with the State Apprenticeship Agency recognized by the Bureau, or if the person is employed in his first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or the State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeyman in any craft classification employed on this contract shall not be greater than the ratio permitted to the contractor as to his entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not a trainee as defined in subparagraph (b) of this clause or is not registered or otherwise employed as stated above, shall be paid the wage rate determined by the Secretary of Labor for the classification of work he actually performed. The contractor or subcontractor will be required to furnish to the contracting officer or a representative of the Wage–Hour Division of the U.S. Department of Labor written evidence of the registration of his program and apprentices as well as the appropriate ratios and wage rates (expressed in percentages of the journeyman hourly rates), for the area of construction prior to using any apprentices on the contract work. The wage paid apprentices shall be not less than the appropriate percentage of the journeyman's rate contained in the applicable wage determination.

(b) Trainees will be permitted to work at less than the predetermined rate for the work performed when they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification, by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training. The ratio of trainees to journeymen employed on this contract shall not be greater than permitted under the plan approved by the Bureau of Apprenticeship and Training. Every trainee must be paid at not less than the rate specified in the approved program for his level of progress. Any employee listed on the payroll at a trainee rate who is not registered and not participating in a training plan approved by the Bureau of Apprenticeship and Training shall be paid not less than the wage rate determined by the Secretary of Labor for the classification of work he actually performed. The contractor or subcontractor will be required to furnish the contracting officer or representative of the Wage–Hour Division of the U.S. Department of Labor written evidence of the certification of his program, the registration of the trainees, and the ratios and wage rates prescribed in that program. In the event the Bureau of Apprenticeship and Training withdraws the approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(c) The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of this contract.

35. PAYROLLS AND BASIC RECORDS

(a) The Contractor shall maintain payrolls and basic records relating thereto during the course of the work and shall preserve them for a period of three (3) years thereafter for all laborers and mechanics, including apprentices, trainees, watchmen, and guards working at the site of the work. Such records shall contain the name and address of each such employee, his correct classification, rate of pay (including rates of contributions for, or costs assumed to provide, fringe benefits), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Contractor has obtained approval from the Secretary of Labor as provided in paragraph (c) of the clause entitled "Davis–Bacon Act," he shall maintain records which show the commitment, its approval, written communication of the plan or program to the laborers or mechanics affected, and the costs anticipated or incurred under the plan or program.

(b) The Contractor shall submit weekly a copy of all payrolls to the Contracting Officer. The Government Prime Contractor shall be responsible for the submission of copies of payrolls of all subcontractors. The copy shall be accompanied by a statement signed by the Contractor indicating that the payrolls are correct and complete, that the wage rates contained therein are not less than those determined by the Secretary of Labor, and that the classifications set forth for each laborer or mechanic, including apprentices and trainees, conform with the work he performed. Submission of the "Weekly Statement of Compliance" required under this contract and the Copeland Regulations of the Secretary of Labor (29 CFR Part 3) shall satisfy the requirement for submission of the above statement. The Contractor shall submit also a copy of any approval by the Secretary of Labor with respect to fringe benefits which is required by paragraph (c) of the clause entitled "Davis–Bacon Act."

(c) The Contractor shall make the records required under this clause available for inspection by authorized representatives of the Contracting Officer and the Department of Labor, and shall permit such representatives to interview employees during working hours on the job.

36. COMPLIANCE WITH COPELAND REGULATIONS

The Contractor shall comply with the Copeland Regulations of the Secretary of Labor (29 CFR Part 3) which are incorporated herein by reference.

37. WITHHOLDING OF FUNDS

(a) The Contracting Officer may withhold or cause to be withheld from the Government Prime Contractor so much of the accrued payments or advances as may be considered necessary (1) to pay laborers and mechanics, including apprentices, trainees, watchmen, and guards employed by the Contractor or any subcontractor on the work the full amount of wages required by the contract, and (2) to satisfy any liability of any Contractor and Subcontractor for liquidated damages under paragraph (b) of the clause entitled "Contract Work Hours and Safety Standards Act–Overtime Compensation."

(b) If any Contractor or subcontractor fails to pay any laborer, mechanic, apprentice, trainee, watchman, or guard employed or working on the site of work, all or part of the wages required by the contract, the Contracting Officer may, after written notice to the Government Prime

Contractor, take such action as may be necessary to cause suspension of any further payments or advances until such violations have ceased.

38. SUBCONTRACTS (1972 FEB)

The Contractor agrees to insert the clauses hereof entitled "Davis–Bacon Act," "Contract Work Hours and Safety Standards Act–Overtime Compensation," "Apprentices and Trainees," "Payrolls and Basic Records," "Compliance with Copeland Regulations," "Withholding of Funds," "Subcontracts," and "Contract Termination–Debarment" in all subcontracts. The term "Contractor" as used in such clauses in any subcontract shall be deemed to refer to the subcontractor except in the phrase "Government Prime Contractor." (ASPR 7–602.23(a)(vii)

39. CONTRACT TERMINATION–DEBARMENT (1972 APR)

A breach of the clauses hereof entitled "Davis–Bacon Act," "Contract Work Hours and Safety Standards Act–Overtime Compensation," "Apprentices and Trainees," "Payrolls and Basic Records," "Compliance with Copeland Regulations," "Withholding of Funds," and "Subcontracts" may be grounds for termination of the contract, and for debarment as provided in 29 CFR 5.6 (ASPR 7–602.23(a)(viii)

40. DISPUTES CONCERNING LABOR STANDARDS (1965 JAN)

Disputes arising out of the labor standards provisions of this contract shall be subject to the Disputes clause except to the extent such disputes involve the meaning of classifications or wage rates contained in the wage determination decision of the Secretary of Labor or the applicability of the labor provisions of this contract which questions shall be referred to the Secretary of Labor in accordance with the procedures of the Department of Labor. (ASPR 7–603.26)

41. CONTRACTOR INSPECTION SYSTEM (1964 NOV)

The Contractor shall (i) maintain an adequate inspection system and perform such inspections as will assure that the work performed under the contract conforms to contract requirements, and (ii) maintain and make available to the Government adequate records of such inspections. (ASPR 7–602.10(a))

42. GRATUITIES (1952 MAR)

(a) The Government may, by written notice to the Contractor, terminate the right of the Contractor to proceed under this contract if it is found, after notice and hearing, by the Secretary or his duly authorized representative, that gratuities (in the form of entertainment, gifts, or otherwise) were offered or given by the Contractor, or any agent or representative of the Contractor, to any officer or employee of the Government with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending, or the making of any determinations with respect to the performing of such contract; *provided*, that the existence of the facts upon which the Secretary or his duly authorized representative makes such findings shall be in issue and may be reviewed in any competent court.

(b) In the event this contract is terminated as provided in paragraph (a) hereof, the Government shall be entitled (i) to pursue the same remedies against the Contractor as it could pursue in the event of a breach of the contract by the Contractor, and (ii) as a penalty in addition to any other damages to which it may be entitled by law, to exemplary damages in an amount (as determined by the Secretary or his duly authorized representative) which shall be not less than three nor more than ten times the costs incurred by the Contractor in providing any such gratuities to any such officer or employee.

(c) The rights and remedies of the Government provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract. (ASPR 7–104.16)

43. SMALL BUSINESS SUBCONTRACTING PROGRAM (MAINTENANCE, REPAIR AND CONSTRUCTION) (1976 OCT)

(The following clause is applicable if this contract is in excess of $500,000)

(a) The Contractor agrees to establish and conduct a small business subcontracting program which will enable small business concerns to be considered fairly as subcontractors, including suppliers, under this contract. In this connection, the Contractor shall designate an individual to (i) maintain liaison with the Government on small business matters, and (ii) administer the Contractor's Small Business Subcontracting Program.

(b) The Contractor shall submit DD Form 1140–1 each quarter in accordance with the instructions provided on the form, except that where the Contractor submits the report on a corporate basis rather than a plant basis, he may submit his reports to the Department having the responsibility for the Small Business Subcontracting Program at the corporate headquarters. The reporting requirements of this subparagraph (b) do not apply to small business contractors, small business subcontractors, or educational and nonprofit institutions.

(c) The Contractor further agrees (i) to insert the "Utilization of Small Business Concerns" clause in subcontracts which offer substantial subcontracting opportunities, and (ii) to insert in each such subcontract exceeding $500,000 a clause conforming substantially to the language of this clause except that subcontractors shall submit DD Form 1140–1 direct to the Government addressees prescribed on the Form. The Contractor will notify the Contracting Officer of the name and address of each subcontractor that will be required to submit a report on DD Form 1140–1. (ASPR 7–602.26(b))

44. RENEGOTIATION (1959 OCT)

(a) To the extent required by law, this contract is subject to the Renegotiation Act of 1951 (50 U.S.C. App. 1211, et seq.), as amended, and to any subsequent act of Congress providing for the renegotiation of contracts. Nothing contained in this clause shall impose any renegotiation obligation with respect to this contract or any subcontract hereunder which is not imposed by an act of Congress heretofore or hereafter enacted. Subject to the foregoing this contract shall be deemed to contain all the provisions required by section 104 of the Renegotiation Act of 1951, and by any such other act, without subsequent contract amendment specifically incorporating such provisions.

(b) The Contractor agrees to insert the provisions of this clause, including this paragraph (b), in all subcontracts, as that term is defined in section 103g of the Renegotiation Act of 1951, as amended. (ASPR 7–103.13(a))

45. NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT (1965 JAN)

(The provisions of this clause shall be applicable only

if the amount of this contract exceeds $10,000.)

(a) The Contractor shall report to the Contracting Officer, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this contract of which the Contractor has knowledge.

(b) In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this contract or out of the use of any supplies furnished or work or services performed hereunder, the Contractor shall furnish to the Government, when requested by the Contracting Officer, all evidence and information in possession of the Contractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Contractor has agreed to indemnify the Government.

(c) This clause shall be included in all subcontracts. (ASPR 7–103.23)

46. AUTHORIZATION AND CONSENT (1964 MAR)

The Government hereby gives its authorization and consent (without prejudice to any rights of indemnification) for all use and manufacture, in the performance of this contract or any part hereof or any amendment hereto or any subcontract hereunder (including any lower–tier subcontract), of any invention described in and covered by a patent of the United States (i) embodied in the structure or composition of any article the delivery of which is accepted by the Government under this contract, or (ii) utilized in the machinery, tools, or methods the use of which necessarily results from compliance by the Contractor or the using subcontractor with (a) specifications or written provisions now or hereafter forming a part of this contract, or (b) specific written instructions given by the Contracting Officer directing the manner of performance. The entire liability to the Government for infringement of a patent of the United States shall be determined solely by the provisions of the indemnity clauses, if any, included in this contract or any subcontract hereunder (including any lower–tier subcontract), and the Government assumes liability for all other infringement to the extent of the authorization and consent hereinabove granted. (ASPR 7–103.22)

47. COMPOSITION OF CONTRACTOR (1965 JAN)

If the Contractor hereunder is comprised of more than one legal entity, each such entity shall be jointly and severally liable hereunder. (ASPR 7–602.32)

48. SITE INVESTIGATION (1965 JAN)

The Contractor acknowledges that he has investigated and satisfied himself as to the conditions affecting the work, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, river stages, tides or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment and facilities needed preliminary to and during prosecution of the work. The Contractor further acknowledges that he has satisfied himself as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the Government, as well as from information presented by the drawings and specifications made a part of this contract. Any failure by the Contractor to acquaint himself with the available information will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the work. The Government assumes no responsibility for any conclusions or interpretations made by the Contractor on the basis of the information made available by the Government. (ASPR 7–602.33)

49. PROTECTION OF EXISTING VEGETATION, STRUCTURES, UTILITIES, AND IMPROVEMENTS (1965 JAN)

(a) The Contractor will preserve and protect all existing vegetation such as trees, shrubs, and grass on or adjacent to the site of work which is not to be removed and which does not unreasonably interfere with the construction work. Care will be taken in removing trees authorized for removal to avoid damage to vegetation to remain in place. Any limbs or branches of trees broken during such operations or by the careless operation of equipment, or by workmen, shall be trimmed with a clean cut and painted with an approved tree pruning compound as directed by the Contracting Officer.

(b) The Contractor will protect from damage all existing improvements or utilities at or near the site of the work, the location of which is made known to him, and will repair or restore any damage to such facilities resulting from failure to comply with the requirements of this contract or the failure to exercise reasonable care in the performance of the work. If the Contractor fails or refuses to repair any such damage promptly, the Contracting Officer may have the necessary work performed and charge the cost thereof to the Contractor. (ASPR 7–602.34)

50. OPERATIONS AND STORAGE AREAS (1965 JAN)

(a) All operations of the Contractor (including storage of materials) upon Government premises shall be confined to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by his operations.

(b) Temporary buildings (storage sheds, shops, offices, etc.) may be erected by the Contractor only with the approval of the Contracting Officer, and shall be built with labor and materials furnished by the Contractor without expense to the Government. Such temporary buildings and utilities shall remain the property of the Contractor and shall be removed by him at his expense upon the completion of the work. With the written consent of the Contracting Officer, such buildings and utilities may be abandoned and need not be removed.

(c) The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways or construct and use such temporary roadways as may be authorized by the Contracting Officer. Where materials are transported in the prosecution of the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State or local law or regulation. When it is necessary to cross curbings or sidewalks, protection against damage shall be provided by the Contractor and any damaged roads, curbings, or sidewalks shall be repaired by, or at the expense of the Contractor. (ASPR 7–602.35)

51. MODIFICATION PROPOSALS – PRICE BREAKDOWN (1968 APR)

The Contractor, in connection with any proposal he makes for a contract modification, shall furnish a price breakdown, itemized as required by the Contracting

Officer. Unless otherwise directed, the breakdown shall be in sufficient detail to permit an analysis of all material, labor, equipment, subcontract, and overhead costs, as well as profit, and shall cover all work involved in the modification, whether such work was deleted, added or changed. Any amount claimed for subcontracts shall be supported by a similar price breakdown. In addition, if the proposal includes a time extension, a justification therefor shall also be furnished. The proposal, together with the price breakdown and time extension justification, shall be furnished by the date specified by the Contracting Officer. (ASPR 7–602.36)

52. SUBCONTRACTORS (1972 FEB)

Within seven days after the award of any subcontract either by himself or a subcontractor, the Contractor shall deliver to the Contracting Officer a statement setting forth the name and address of the subcontractor and a summary description of the work subcontracted. The Contractor shall at the same time furnish a statement signed by the subcontractor acknowledging the inclusion in his subcontract of the clauses of this contract entitled "Equal Opportunity," "Davis–Bacon Act," "Contract Work Hours and Safety Standards Act – Overtime Compensation," "Apprentices and Trainees," "Payrolls and Basic Records," "Compliance with Copeland Regulations," "Withholding of Funds," "Subcontracts" and "Contract Termination – Debarment." Nothing contained in this contract shall create any contractual relation between the subcontractor and the Government. (ASPR 7–602.37)

53. CLEANING UP (1965 JAN)

The Contractor shall at all times keep the construction area, including storage areas used by him, free from accumulations of waste material or rubbish and prior to completion of the work remove any rubbish from the premises and all tools, scaffolding, equipment, and materials not the property of the Government. Upon completion of the construction the Contractor shall leave the work and premises in a clean, neat and workmanlike condition satisfactory to the Contracting Officer. (ASPR 7–602.40)

54. ADDITIONAL DEFINITIONS (1965 JAN)

(a) Wherever in the specifications or upon the drawings the words "directed," "required," "ordered," "designated," "prescribed," or words of like import are used, it shall be understood that the "direction," "requirement," "ordered," "designation," or "prescription," of the Contracting Officer is intended and similarly the words "approved," "acceptable," "satisfactory" or words of like import shall mean "approved by" or "acceptable to," or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.

(b) Where "as shown," "as indicated," "as detailed," or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provided complete in place," that is "furnished and installed." (ASPR 7–602 4I)

55. ACCIDENT PREVENTION (1977 JUN)

(a) In order to provide safety controls for protection to the life and health of employees and other persons; for prevention of damage to property, materials, supplies, and equipment; and for avoidance of work interruptions in the performance of this contract, the Contractor shall comply with all pertinent provisions of Corps of Engineers Manual, EM 385–1–1, dated 1 June 1977, entitled "General Safety Requirements", as amended, and will also take or cause to be taken such additional measures as the Contracting Officer may determine to be reasonably necessary for the purpose.

(b) The Contractor will maintain an accurate record of, and will report to the Contracting Officer in the manner and on the forms prescribed by the Contracting Officer, exposure data and all accidents resulting in death, traumatic injury, occupational disease, and damage to property, materials, supplies and equipment incident to work performed under this contract.

(c) The Contracting Officer will notify the Contractor of any noncompliance with the foregoing provisions and the action to be taken. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

(d) Compliance with the provisions of this clause by subcontractors will be the responsibility of the Contractor.

(e) Prior to commencement of the work the Contractor will:

(1) submit in writing his proposals for effectuating this provision for accident prevention;

(2) meet in conference with representatives of the Contracting Officer to discuss and develop mutual understandings relative to administration of the over–all safety program. (ASPR 7–602.42(a) & (b))

56. GOVERNMENT INSPECTORS (1965 JAN)

The work will be conducted under the general direction of the Contracting Officer and is subject to inspection by his appointed inspectors to insure strict compliance with the terms of the contract. No inspector is authorized to change any provision of the specifications without written authorization of the Contracting Officer, nor shall the presence or absence of an inspector relieve the Contractor from any requirements of the contract. (ASPR 7–602.43)

57. RIGHTS IN SHOP DRAWINGS (1966 APR)

(Applicable to all contracts calling for the delivery of shop drawings)

(a) Shop drawings for construction means drawings, submitted to the Government by the Construction Contractor, subcontractor or any lower tier subcontractor pursuant to a construction contract, showing in detail (i) the proposed fabrication and assembly of structural elements and (ii) the installation (i.e., form, fit, and attachment details) of materials or equipment. The Government may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

(b) This clause, including this paragraph (b), shall be included in all subcontracts hereunder at any tier. (ASPR 7–602.47)

58. MINORITY BUSINESS ENTERPRISES SUBCONTRACTING PROGRAM (1971 NOV)

(The following clause is applicable if this contract is in excess of $500,000)

(a) The Contractor agrees to establish and conduct

a program which will enable minority business enterprises (as defined in the clause, entitled, "Utilization of Minority Business Enterprises") to be considered fairly as subcontractors and suppliers under this contract. In this connection, the Contractor shall:

(1) Designate a liaison officer who will administer the Contractor's "Minority Business Enterprises Program."

(2) Provide adequate and timely consideration of the potentialities of known minority business enterprises in all "make–or–buy" decisions.

(3) Assure that known minority business enterprises will have an equitable opportunity to compete for subcontracts, particularly by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation of minority business enterprises.

(4) Maintain records showing (i) procedures which have been adopted to comply with the policies set forth in this clause, including the establishment of a source list of minority business enterprises, (ii) awards to minority business enterprises on the source list, and (iii) specific efforts to identify and award contracts to minority business enterprises.

(5) Include the "Utilization of Minority Business Enterprises" clause in subcontracts which offer substantial minority business enterprise subcontracting opportunities.

(6) Cooperate with the Contracting Officer in any studies and surveys of the Contractor's minority business enterprises procedures and practices that the Contracting Officer may from time to time conduct.

(7) Submit periodic reports of subcontracting to known minority business enterprises with respect to the records referred to in subparagraph (4) above, in such form and manner and at such time (not more often than quarterly) as the Contracting Officer may prescribe.

(b) The Contractor further agrees to insert, in any subcontract hereunder which may exceed $500,000 provisions which shall conform substantially to the language of this clause, including this paragraph (b), and to notify the Contracting Officer of the names of such subcontractors. (ASPR 7–104.36(b))

CONTINUED ON NEXT PAGE

CONTINUED ON NEXT PAGE

59. AFFIRMATIVE ACTION FOR DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA (1976 JUL)

(This clause is applicable pursuant to 41 C.F.R. 60–250, if this contract is for $10,000 or more.)

(a) The contractor will not discriminate against any employee or applicant for employment because he or she is a disabled veteran or veteran of the Vietnam era in regard to any position for which the employee or applicant for employment is qualified. The contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified disabled veterans and veterans of the Vietnam era without discrimination based upon their disability or veterans status in all employment practices such as the following: employment upgrading, demotion or transfer, recruitment, advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.

(b) The contractor agrees that all suitable employment openings of the contractor which exist at the time of the execution of this contract and those which occur during the performance of this contract, including those not generated by this contract and including those occurring at an establishment of the contractor other than the one wherein the contract is being performed but excluding those of independently operated corporate affiliates, shall be listed at an appropriate local office of the State employment service system wherein the opening occurs. The contractor further agrees to provide such reports to such local office regarding employment openings and hires as may be required.

State and local government agencies holding Federal contracts of $10,000 or more shall also list all their suitable openings with the appropriate office of the State employment service, but are not required to provide those reports set forth in paragraphs (d) and (e).

(c) Listing of employment openings with the employment service system pursuant to this clause shall be made at least concurrently with the use of any other recruitment source or effort and shall involve the normal obligations which attach to the placing of a bona fide job order, including the acceptance of referrals of veterans and nonveterans. The listing of employment openings does not require the hiring of any particular job applicant or from any particular group of job applicants, and nothing herein is intended to relieve the contractor from any requirements in Executive Orders or regulations regarding nondiscrimination in employment.

(d) The reports required by paragraph (b) of this clause shall include, but not be limited to, periodic reports which shall be filed at least quarterly with the appropriate local office or, where the contractor has more than one hiring location in a State, with the central office of that State employment service. Such reports shall indicate for each hiring location (1) the number of individuals hired during the reporting period, (2) the number of nondisabled veterans of the Vietnam era hired, (3) the number of disabled veterans of the Vietnam era hired, and (4) the total number of disabled veterans hired. The reports should include covered veterans hired for on–the–job training under 38 USC 1787. The contractor shall submit a report within 30 days after the end of each reporting period wherein any performance is made on this contract identifying data for each hiring location. The contractor shall maintain at each hiring location copies of the reports submitted until the expiration of one year after final payment under the contract, during which time these reports and related documentation shall be made available, upon request, for examination by any authorized representatives of the contracting officer or of the Secretary of Labor. Documentation would include personnel records respecting job openings, recruitment and placement.

(e) Whenever the contractor becomes contractually bound to the listing provisions of this clause, it shall advise the employment service system in each State where it has establishments of the name and location of each hiring location in the State. As long as the contractor is contractually bound to these provisions and has so advised the State system, there is no need to advise the State system of subsequent contracts. The contractor may advise the State system when it is no longer bound by this contract clause.

(f) This clause does not apply to the listing of employment openings which occur and are filled outside of the 50 States, the District of Columbia, Puerto Rico, Guam, and the Virgin Islands.

(g) The provisions of paragraphs (b), (c), (d) and (e) of this clause do not apply to openings which the contractor proposes to fill from within his own organization or to fill pursuant to a customary and traditional employer–union hiring arrangement. This exclusion does not apply to a particular opening once an employer decides to consider applicants outside of his own organization or employer–union arrangement for that opening.

(h) As used in this clause: (1) "All suitable employment openings" includes, but is not limited to, openings which occur in the following job categories: production and nonproduction; plant and office; laborers and mechanics; supervisory and nonsupervisory; technical; and executive, administrative, and professional openings as are compensated on a salary basis of less than $25,000 per year. This term includes full–time employment, temporary employment of more than 3 days' duration, and part–time employment. It does not include openings which the contractor proposes to fill from within his own organization or to fill pursuant to a customary and traditional employer–union hiring arrangement nor openings in an educational institution which are restricted to students of that institution. Under the most compelling circumstances an employment opening may not be suitable for listing, including such situations where the needs of the Government cannot reasonably be otherwise supplied, where listing would be contrary to national security, or where the requirement of listing would otherwise not be for the best interest of the Government.

(2) "Appropriate office of the State employment service system" means the local office of the Federal–State national system of public employment offices with assigned responsibility for serving the area where the employment opening is to be filled, including the District of Columbia, Guam, Puerto Rico, and the Virgin Islands.

(3) "Openings which the contractor proposes to

fill from within his own organization" means employment openings for which no consideration will be given to persons outside the contractor's organization (including any affiliates, subsidiaries, and the parent companies) and includes any openings which the contractor proposes to fill from regularly established "recall" lists.

(4) "Openings which the contractor proposes to fill pursuant to a customary and traditional employer–union hiring arrangement" means employment openings which the contractor proposes to fill from union halls, which is part of the customary and traditional hiring relationship which exists between the contractor and representatives of his employees.

(i) The contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Vietnam Veterans Readjustment Act, hereinafter referred to as the "Act" (38 U.S.C. 2012).

(j) In the event of the contractor's noncompliance with the requirements of this clause, actions for noncompliance may be taken in accordance with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.

(k) The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices in a form to be prescribed by the Director, Office of Federal Contract Compliance Programs, provided by or through the contracting officer. Such notice shall state the contractor's obligation under the law to take affirmative action to employ and advance in employment qualified disabled veterans and veterans of the Vietnam era for employment, and the rights of applicants and employees.

(l) The contractor will notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the contractor is bound by the terms of the Vietnam Era Veterans Readjustment Assistance Act, and is committed to take affirmative action to employ and advance in employment qualified disabled veterans and veterans of the Vietnam Era.

(m) The contractor will include the provisions of this clause in every subcontract or purchase order of $10,000 or more unless exempted by rules, regulations, or orders of the Secretary issued pursuant to the Act, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the Director of the Office of Federal Contract Compliance Programs may direct to enforce such provisions, including action for noncompliance. (ASPR 7–103.27)

60. VALUE ENGINEERING INCENTIVE (1977 APR)

(a) Application. This clause applies to a Contractor developed and documented Value Engineering Change Proposal (VECP) which:

(i) requires a change to this contract to implement the VECP; and

(ii) reduces the contract price without impairing essential function or characteristics, provided that it is not based solely on a change in deliverable end item quantities.

(b) Documentation. As a minimum, the following information shall be submitted by the contractor with each VECP:

(i) a description of the difference between the existing contract requirement and the proposed change, and the comparative advantages and disadvantages of each; justification where function or characteristics of a work item is being altered; and the effect of the change on the performance of the end item;

(ii) an analysis and itemization of the requirements of the contract which must be changed if the VECP is accepted and a recommendation as to how to make each such change (e.g., a suggested specification revision);

(iii) a separate detailed cost estimate for both the existing contract requirement and the proposed change to provide an estimate of the reduction in costs, if any, that will result from acceptance of the VECP, taking into account the costs of development and implementation by the Contractor (including any amount attributable to subcontracts in accordance with paragraph (f) below);

(iv) a prediction of any effects the proposed change would have on related costs to the Military Department such as Government furnished property costs, and costs of maintenance and operation;

(v) a statement of the time by which a change order adopting the VECP must be issued so as to obtain the maximum cost reduction during the remainder of this contract, noting any effect on the contract completion time or delivery schedule; and

(vi) identification of any previous submission of the VECP, including the dates submitted, the agencies involved, the numbers of the Government contracts involved, and the previous actions by the Government, if known.

(c) Submission. To expedite a determination, VECPs shall be submitted to the Resident Engineer at the worksite with a copy to the Contracting Officer. Proposals shall be processed expeditiously; however, the Government shall not be liable for any delay in acting upon any proposal submitted pursuant to this clause. The Contractor has the right to withdraw, in whole or in part, any VECP at any time prior to acceptance by the Government.

(d) Acceptance. The Contracting Officer may accept, in whole or in part, by contract modification any VECP submitted pursuant to this clause. The Contracting Officer may accept the VECP even though an agreement on price reduction has not been reached, by issuing the Contractor a notice to proceed with the change. Until a notice to proceed is issued or a contract modification applies a VECP to this contract, the Contractor shall remain obligated to perform in accordance with this contract. Contract modifications made pursuant to this clause will so state. The decision of the Contracting Officer as to the acceptance of any VECP under this contract shall be final and shall not be subject to the "Disputes" clause of this contract.

(e) Sharing. If a VECP submitted by the Contractor pursuant to this clause is accepted, the contract price shall be adjusted without regard to profit in accordance with the following provisions:

(i) Definition:

(A) Instant contract savings to the Contractor (ICS) are the estimated reduction in the Contractor's cost

of performance resulting from the acceptance of the VECP. The proposed cost reduction includes estimated allowable Contractor development and implementation costs (CC). The Contractor's development and implementation costs include any subcontractor development and implementation costs (see (f) below). For purposes of this clause, Contractor development costs are those costs incurred after the Contractor has identified a specific VE project and prior to acceptance and implementation by the Government.

(B) Government Costs (GC) are those DOD costs which directly result from development and implementation of the VECP, such as test and evaluation of the VECP.

(ii) Calculations and Actions.
Multiply ICS by 45% and GC by 55%. Add these two results, e.g., (.45 ICS + .55 GC) and subtract from the contract price.

(f) Subcontracts. The Contractor shall include appropriate VE arrangements in any subcontract of $50,000 or greater, and may include such arrangements in contracts of lesser value. To compute any adjustment in the contract price under paragraph (e) above, the Contractor's cost of development and implementation of a VECP which is accepted under this contract shall include any development and implementation costs of a subcontractor which clearly pertains to such VECP, but shall exclude any VE incentive payments which the Contractor may make to a subcontractor. The Contractor may make whatever VE incentive payment arrangements he chooses with his subcontractors, *provided* that any payments to subcontractors under such arrangements are made from the Contractor's, and not the Government's, share of the savings resulting from the VECP.

(g) Data. The Contractor may restrict the Government's right to use any sheet of a VECP or of the supporting data, submitted pursuant to this clause, in accordance with the terms of the following legend if it is marked on such sheet:

"This data furnished pursuant to the Value Engineering Incentive clause of contract _____ shall not be disclosed outside the Government, or duplicated, used, or disclosed, in whole or in part, for any purpose other than to evaluate a VECP submitted under said clause. This restriction does not limit the Government's right to use information contained in this data if it is or has been obtained, or is otherwise available, from the Contractor or from another source, without limitations. If such a VECP is accepted by the Government under said contract after the use of this data in such an evaluation, the Government shall have the right to duplicate, use, and disclose any data reasonably necessary to the full utilization of such VECP as accepted, in any manner and for any purpose whatsoever, and have others so do."

In the event of acceptance of a VECP, the Contractor hereby grants to the Government all rights to use, duplicate or disclose, in whole or in part, in any manner and for any purpose whatsoever, and to have or permit others to do so, any data reasonably necessary to fully utilize such VECP. (ASPR 7–602.50)

61. AFFIRMATIVE ACTION FOR HANDICAPPED WORKERS (1976 MAY)

(a) The contractor will not discriminate against any employee or applicant for employment because of physical or mental handicap in regard to any position for which the employee or applicant for employment is qualified. The contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified handicapped individuals without discrimination based upon their physical or mental handicap in all employment practices such as the following: employment, upgrading, demotion or transfer, recruitment, advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.

(b) The contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.

(c) In the event of the contractor's noncompliance with the requirements of this clause, action for noncompliance may be taken in accordance with the rules, regulations and relevant orders of the Secretary of Labor issued pursuant to the Act.

(d) The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices in a form to be prescribed by the Director, provided by or through the contracting officer. Such notices shall state the contractor's obligation under the law to take affirmative action to employ and advance in employment qualified handicapped employees and applicants for employment, and the rights of applicants and employees.

(e) The contractor will notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the contractor is bound by the terms of section 503 of the Rehabilitation Act of 1973, and is committed to take affirmative action to employ and advance in employment physically and mentally handicapped individuals.

(f) The contractor will include the provisions of this clause in every subcontract or purchase order of $2,500 or more unless exempted by rules, regulations, or orders of the Secretary issued pursuant to section 503 of the Act, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the Director of the Office of Federal Contract Compliance Programs may direct to enforce such provisions, including action for noncompliance. (ASPR 7–103.28)

62. CLEAN AIR AND WATER (1975 OCT)

(Applicable only if the contract exceeds $100,000, or the contracting officer has determined that orders under an indefinite quantity contract in any one year will exceed $100,000, or a facility to be used has been the subject of a conviction under the Clean Air Act (42 U.S.C. 1857c–8(c)(1)) or the Federal Water Pollution Control Act (33 U.S.C. 1319(c)) and is listed by EPA, or the contract is not otherwise exempt.)

(a) The Contractor agrees as follows:

(i) To comply with all the requirements of section 114 of the Clean Air Act, as amended (42 U.S.C. 1857, et seq., as amended by Public Law 91-604) and section 308 of the Federal Water Pollution Control Act (33 U.S.C. 1251, as amended by Public Law 92-500), respectively, relating to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, respectively, and all regulations and guidelines issued thereunder before the award of this contract;

(ii) That no portion of the work required by this prime contract will be performed in a facility listed on the Environmental Protection Agency List of Violating Facilities on the date this contract was awarded unless and until the EPA eliminates the name of such facility or facilities from such listing;

(iii) To use his best efforts to comply with clean air standards and clean water standards at the facilities in which the contract is being performed; and

(iv) To insert the substance of the provisions of this clause in any nonexempt subcontract, including this paragraph (iv).

(b) The terms used in this clause have the following meanings.

(i) The term *"Air Act"* means the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Public Law 91-604).

(ii) The term *"Water Act"* means Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Public Law 92-500).

(iii) The term *"clean air standards"* means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted pursuant to the Air Act or Executive Order 11738, an applicable implementation plan as described in section 110(d) of the Clean Air Act (42 U.S.C. 1857c-5(d), an approved implementation procedure or plan under section 111(c) or section 111(d), respectively, of the Air Act (42 U.S.C. 1857c-6(c) or (d)), or an approved implementation procedure under section 112(d) of the Air Act (42 U.S.C. 1857c-7(d)).

(iv) The term *"clean water standards"* means any enforceable limitation, control, condition, prohibition, standard or other requirement which is promulgated pursuant to the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by a local government to ensure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. 1317).

(v) The term *"compliance"* means compliance with clean air or water standards. Compliance shall also mean compliance with a schedule or plan ordered or approved by a court of competent jurisdiction, the Environmental Protection Agency or an air or water pollution control agency in accordance with the requirement of the Air Act or Water Act and regulations issued pursuant thereto.

(vi) The term *"facility"* means any building, plant, installation, structure, mine, vessel or other floating craft, location, or site of operations, owned, leased, or supervised by a contractor, subcontractor, to be utilized in the performance of a contract or subcontract. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location or site shall be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are colocated in one geographical area.

(vii) The term *"nonexempt contract or subcontract"* means a contract or subcontract of more than $100,000 which is not otherwise exempted pursuant to the EPA regulations implementing the Air Act and Water Act (40 CFR 15.5), as further implemented in ASPR 1-2302.4 or in FPR 1-1.2302-4 (whichever is applicable) and the procedures of the Department awarding the contract. (ASPR 7-103.29)

63. NOTICE TO THE GOVERNMENT OF LABOR DISPUTES (1958 SEP)

(a) Whenever the Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of this contract, the Contractor shall immediately give notice thereof, including all relevant information with respect thereto, to the Contracting Oficer.

(b) The Contractor agrees to insert the substance of this clause, including this paragraph (b), in any subcontract hereunder as to which a labor dispute may delay the timely performance of this contract; except that each such subcontract shall provide that in the event its timely performance is delayed or threatened by delay by any actual or potential labor dispute, the subcontractor shall immediately notify his next higher tier subcontractor, or the prime contractor, as the case may be, of all relevant information with respect to such dispute. (ASPR 7-104.4)

64. CONTRACT PRICES - BIDDING SCHEDULE (1968 APR)

(The following clause is applicable to contracts containing unit prices)

Payment for the various items listed in the Bidding Schedule shall constitute full compensation for furnishing all plant, labor, equipment, appliances, and materials, and for performing all operations required to complete the work in conformity with the drawings and specifications. All costs for work not specifically mentioned in the Bidding Schedule shall be included in the contract prices for the items listed. (ASPR 7-603.5)

65. PRIORITIES, ALLOCATIONS, AND ALLOTMENTS (1975 OCT)

(The following clause is applicable to rateable contracts)

The Contractor shall follow the provisions of DMS Reg. 1 or DPS Reg. 1 and all other applicable regulations and orders of the Bureau of Domestic Commerce in obtaining controlled materials and other products and materials needed to fill this order. (ASPR 7-104.18)

66. PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA - PRICE ADJUSTMENT (1970 JAN)

(The following clause is applicable if this contract is in excess of $100,000)

(a) This clause shall become operative only with respect to any modification of this contract which involves aggregate increases and/or decreases in costs plus applicable profits in excess of $100,000 unless the modification is priced on the basis of adequate competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by law or regulation. The right to price reduction under this clause is limited to defects in data relating to such modification.

(b) If any price, including profit, or fee, negotiated

in connection with any price adjustment under this contract was increased by any significant sums because:

(i) the Contractor furnished cost or pricing data which was not complete, accurate and current as certified in the Contractor's Certificate of Current Cost or Pricing Data;

(ii) a subcontractor, pursuant to the clause of this contract entitled "Subcontractor Cost or Pricing Data" or "Subcontractor Cost or Pricing Data – Price Adjustments" or any subcontract clause therein required, furnished cost or pricing data which was not complete, accurate and current as certified in the subcontractor's Certificate of Current Cost or Pricing Data;

(iii) a subcontractor or prospective subcontractor furnished cost or pricing data which was required to be complete, accurate and current and to be submitted to support a subcontract cost estimate furnished by the Contractor but which was not complete, accurate and current as of the date certified in the Contractor's Certificate of Current Cost or Pricing Data; or

(iv) the Contractor or a subcontractor or prospective subcontractor furnished any data, not within (i), (ii) or (iii) above, which was not accurate, as submitted;

the price shall be reduced accordingly and the contract shall be modified in writing as may be necessary to reflect such reduction. However, any reduction in the contract price due to defective subcontract data of a prospective subcontractor, when the subcontract was not subsequently awarded to such subcontractor, will be limited to the amount (plus applicable overhead and profit markup) by which the actual subcontract, or actual cost to the Contractor if there was no subcontract, was less than the prospective subcontract cost estimate submitted by the Contractor, *provided* the actual subcontract price was not affected by defective cost or pricing data.

Note: Since the contract is subject to reduction under this clause by reason of defective cost or pricing data submitted in connection with certain subcontracts, it is expected that the contractor may wish to include a clause in each such subcontract requiring the subcontractor to appropriately indemnify the contractor. However, the inclusion of such a clause and the terms thereof are matters for negotiation and agreement between the contractor and the subcontractor, *provided* that they are consistent with ASPR 23–203 relating to Disputes provisions in subcontracts. It is also expected that any subcontractor subject to such indemnification will generally require substantially similar indemnification for defective cost or pricing data required to be submitted by his lower tier subcontractors. (ASPR 7–104.29(b))

67. INTEREST (1972 MAY)

Notwithstanding any other provision of this contract, unless paid within thirty (30) days, all amounts that become payable by the Contractor to the Government under this contract (net of any applicable tax credit under the Internal Revenue Code) shall bear interest from the date due until paid and shall be subject to adjustments as provided by Part 6 of Appendix E of the Armed Services Procurement Regulation, as in effect on the date of this contract. The interest rate per annum shall be the interest rate in effect which has been established by the Secretary of the Treasury pursuant to Public Law 92–41; 85 STAT 97 for the Renegotiation Board, as of the date the amount becomes due as herein provided. Amounts shall be due upon the earliest one of (i) the date fixed pursuant to this contract; (ii) the date of the first written demand for payment, consistent with this contract, including demand consequent upon default termination; (iii) the date of transmittal by the Government to the Contractor of a proposed supplemental agreement to confirm completed negotiations fixing the amount; or (iv) if this contract provides for revision of prices, the date of written notice to the Contractor stating the amount of refund payable in connection with a pricing proposal or in connection with a negotiated pricing agreement not confirmed by contract supplement. (ASPR 7–104.39)

68. AUDIT BY DEPARTMENT OF DEFENSE (1975 JUN)

(The following clause is applicable unless this contract was entered into by formal advertising and is not in excess of $100,000)

(a) *General.* The Contracting Officer or his representatives shall have the audit and inspection rights described in the applicable paragraphs (b), (c) and (d) below.

(b) *Examination of Costs.* If this is a cost reimbursement type, incentive, time and materials, labor hour, or price redeterminable contract, or any combination thereof, the Contractor shall maintain, and the Contracting Officer or his representatives shall have the right to examine books, records, documents, and other evidence and accounting procedures and practices, sufficient to reflect properly all direct and indirect costs of whatever nature claimed to have been incurred and anticipated to be incurred for the performance of this contract. Such right of examination shall include inspection at all reasonable times of the Contractor's plants, or such parts thereof, as may be engaged in the performance of this contract.

(c) *Cost or Pricing Data.* If the Contractor submitted cost or pricing data in connection with the pricing of this contract or any change or modification thereto, unless such pricing was based on adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by law or regulation, the Contracting Officer or his representatives who are employees of the United States Government shall have the right to examine all books, records, documents and other data of the Contractor related to the negotiation, pricing or performance of such contract, change or modification, for the purpose of evaluating the accuracy, completeness and currency of the cost or pricing data submitted. Additionally, in the case of pricing any change or modification exceeding $100,000 to formally advertised contracts, the Comptroller General of the United States or his representatives who are employees of the United States Government shall have such rights. The right of examination shall extend to all documents necessary to permit adequate evaluation of the cost or pricing data submitted, along with the computations and projections used therein.

(d) *Reports.* If the Contractor is required to furnish Cost Information Reports (CIR) or Contract Fund Status Reports (CFSR), the Contracting Officer or his representatives shall have the right to examine books, records, documents, and supporting materials, for the purpose of evaluating (i) the effectiveness of the Contractor's policies and procedures to produce data compatible with the objectives of these reports, and (ii) the data reported.

(e) *Availability.* The materials described in (b), (c) and (d) above shall be made available at the office of the Contractor, at all reasonable times, for inspection, audit, or reproduction, until the expiration of three years

from the date of final payment under this contract or such lesser time specified in Appendix M of the Armed Services Procurement Regulation, and for such longer period, if any, as is required by applicable statute, or by other clauses of this contract, or by (1) and (2) below:

(1) If this contract is completely or partially terminated, the records relating to the work terminated shall be made available for a period of three years from the date of any resulting final settlement.

(2) Records which relate to appeals under the "Disputes" clause of this contract, or litigation or the settlement of claims arising out of the performance of this contract, shall be made available until such appeals, litigation, or claims have been disposed of.

(f) The Contractor shall insert a clause containing all the provisions of this clause, including this paragraph (f), in all subcontracts exceeding $10,000 hereunder, except altered as necessary for proper identification of the contracting parties and the Contracting Officer under the Government prime contract. (ASPR 7–104.41(a))

69. SUBCONTRACTOR COST OR PRICING DATA – PRICE ADJUSTMENTS (1970 JAN)

(The following clause is applicable if this contract is in excess of $100,000)

(a) Paragraphs (b) and (c) of this clause shall become operative only with respect to any modification made pursuant to one or more provisions of this contract which involves aggregate increases and/or decreases in costs plus applicable profits expected to exceed $100,000. The requirements of this clause shall be limited to such modifications.

(b) The Contractor shall require subcontractors hereunder to submit cost or pricing data under the following circumstances: (i) prior to the award of any subcontract the amount of which is expected to exceed $100,000 when entered into; (ii) prior to the pricing of any subcontract modification which involves aggregate increases and/or decreases in costs plus applicable profits expected to exceed $100,000; except where the price is based on adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by law or regulation.

(c) The Contractor shall require subcontractors to certify that to the best of their knowledge and belief the cost and pricing data submitted under (b) above is accurate, complete, and current as of the date of agreement on the negotiated price of the subcontract or subcontract change or modification.

(d) The Contractor shall insert the substance of this clause including this paragraph (d) in each subcontract which exceeds $100,000. (ASPR 7–104.42(b))

70.1 GOVERNMENT–FURNISHED PROPERTY (SHORT FORM) (1964 NOV)

(The following clause is applicable when Government Property having an acquisition cost of $25,000 or less is furnished to or acquired by the Contractor)

(a) The Government shall deliver to the Contractor, for use only in connection with this contract, the property described in the schedule or specifications (hereinafter referred to as "Government–furnished property"), at the times and locations stated therein. If the Government–furnished property, suitable for its intended use, is not so delivered to the Contractor, the Contracting Officer shall, upon timely written request made by the Contractor, and if the facts warrant such action, equitably adjust any affected provision of this contract pursuant to the procedures of the "Changes" clause hereof.

(b) Title to Government–furnished property shall remain in the Government. The Contractor shall maintain adequate property control records of Government–furnished property in accordance with sound industrial practice.

(c) Unless otherwise provided in this contract, the Contractor, upon delivery to him of any Government–furnished property, assumes the risk of, and shall be responsible for, any loss thereof or damage thereto except for reasonable wear and tear, and except to the extent that such property is consumed in the performance of this contract.

(d) The Contractor shall, upon completion of this contract, prepare for shipment, deliver f.o.b. origin, or dispose of all Government–furnished property not consumed in the performance of this contract or not theretofore delivered to the Government, as may be directed or authorized by the Contracting Officer. The net proceeds of any such disposal shall be credited to the contract price or paid in such other manner as the Contracting Officer may direct. (ASPR 7–104.24(f))

70.2 GOVERNMENT PROPERTY (FIXED PRICE) (1968 SEP)

(The following clause is applicable when Government Property having an acquisition cost in excess of $25,000 is furnished to or acquired by the Contractor)

(a) *Government–Furnished Property.* The Government shall deliver to the Contractor, for use in connection with and under the terms of this contract, the property described as Government–furnished property in the Schedule or specifications, together with such related data and information as the Contractor may request and as may reasonably be required for the intended use of such property (hereinafter referred to as "Government–furnished property"). The delivery or performance dates for the supplies or services to be furnished by the Contractor under this contract are based upon the expectation that Government–furnished property suitable for use (except for such property furnished "as is") will be delivered to the Contractor at the times stated in the Schedule or, if not so stated, in sufficient time to enable the Contractor to meet such delivery or performance dates. In the event that Government–furnished property is not delivered to the Contractor by such time or times, the Contracting Officer shall, upon timely written request made by the Contractor, make a determination of the delay, if any, occasioned the Contractor thereby, and shall equitably adjust the delivery or performance dates or the contract price, or both, and any other contractual provision affected by any such delay, in accordance with the procedures provided for in the clause of this contract entitled "Changes." Except for Government–furnished property furnished "as is," in the event the Government–furnished property is received by the Contractor in a condition not suitable for the intended use the Contractor shall, upon receipt thereof, notify the Contracting Officer of such fact and, as directed by the Contracting Officer, either (i) return such property at the Government's expense or otherwise dispose of the property, or (ii) effect repairs or modifications. Upon the completion of (i) or (ii) above, the Contracting Officer upon written request of the Contractor shall equitably adjust the delivery or performance dates or the contract price, or both, and any other contractual provision affected by the rejection or disposition, or the repair or modification, in accordance with the procedures provided for in the clause of this contract entitled "Changes." The foregoing provisions for adjustment are exclusive and the Government shall not be liable to suit for breach of contract by reason of any delay in delivery of Government–furnished property or delivery of such property in a condition not suitable for its

intended use.

(b) *Changes in Government-furnished Property.*

(1) By notice in writing, the Contracting Officer may (i) decrease the property provided or to be provided by the Government under this contract, or (ii) substitute other Government-owned property for property to be provided by the Government, or to be acquired by the Contractor for the Government, under this contract. The Contractor shall promptly take such action as the Contracting Officer may direct with respect to the removal and shipping of property covered by such notice.

(2) In the event of any decrease in or substitution of property pursuant to subparagraph (1) above, or any withdrawal of authority to use property provided under any other contract or lease, which property the Government had agreed in the Schedule to make available for the performance of this contract, the Contracting Officer, upon the written request of the Contractor (or, if the substitution of property causes a decrease in the cost of performance, on his own initiative), shall equitably adjust such contractual provisions as may be affected by the decrease, substitution, or withdrawal, in accordance with the procedures provided for in the "Changes" clause of this contract.

(c) *Title.* Title to all property furnished by the Government shall remain in the Government. In order to define the obligations of the parties under this clause, title to each item of facilities, special test equipment, and special tooling (other than that subject to a "Special Tooling" clause) acquired by the Contractor for the Government pursuant to this contract shall pass to and vest in the Government when its use in the performance of this contract commences, or upon payment therefor by the Government, whichever is earlier, whether or not title previously vested. All Government-furnished property, together with all property acquired by the Contractor title to which vests in the Government under this paragraph, is subject to the provisions of this clause and is hereinafter collectively referred to as "Government property." Title to Government property shall not be affected by the incorporation or attachment thereof to any property not owned by the Government, nor shall such Government property, or any part thereof, be or become a fixture or lose its identity as personalty by reason of affixation to any realty.

(d) *Property Administration.* The Contractor shall comply with the provisions of Appendix B, Armed Services Procurement Regulation, as in effect on the date of the contract, which is hereby incorporated by reference and made a part of this contract. Material to be furnished by the Government shall be ordered or returned by the Contractor, when required, in accordance with the "Manual for Military Standard Requisitioning and Issue Procedure (MILSTRIP) for Defense Contractors" (Appendix H, Armed Services Procurement Regulation) as in effect on the date of this contract, which Manual is hereby incorporated by reference and made a part of this contract.

(e) *Use of Government Property.* The Government property shall, unless otherwise provided herein or approved by the Contracting Officer, be used only for the performance of this contract.

(f) *Utilization, Maintenance and Repair of Government Property.* The Contractor shall maintain and administer, in accordance with sound industrial practice, and in accordance with applicable provisions of Appendix B, a program for the utilization, maintenance, repair, protection, and preservation of Government property until disposed of by the Contractor in accordance with this clause. In the event that any damage occurs to Government property the risk of which has been assumed by the Government under this contract, the Government shall replace such items or the Contractor shall make such repair of the property as the Government directs; *provided,* however, that if the Contractor cannot effect such repair within the time required, the Contractor shall dispose of such property in the manner directed by the Contracting Officer. The contract price includes no compensation to the Contractor for the performance of any repair or replacement for which the Government is responsible, and an equitable adjustment will be made in any contractual provisions affected by such repair or replacement of Government property made at the direction of the Government, in accordance with the procedures provided for in the "Changes" clause of this contract. Any repair or replacement for which the Contractor is responsible under the provisions of this contract shall be accomplished by the Contractor at his own expense.

(g) *Risk of Loss.* Unless otherwise provided in this contract, the Contractor assumes the risk of, and shall be responsible for, any loss of or damage to Government property provided under this contract upon its delivery to him or upon passage of title thereto to the Government as provided in paragraph (c) hereof, except for reasonable wear and tear and except to the extent that such property is consumed in the performance of this contract.

(h) *Access.* The Government, and any persons designated by it, shall at all reasonable times have access to the premises wherein any Government property is located, for the purpose of inspecting the Government property.

(i) *Final Accounting and Disposition of Government Property.* Upon the completion of this contract, or at such earlier dates as may be fixed by the Contracting Officer, the Contractor shall submit, in a form acceptable to the Contracting Officer, inventory schedules covering all items of Government property not consumed in the performance of this contract (including any resulting scrap) or not theretofore delivered to the Government, and shall prepare for shipment, deliver f.o.b. origin, or dispose of the Government property, as may be directed or authorized by the Contracting Officer. The net proceeds of any such disposal shall be credited to the contract price or shall be paid in such other manner as the Contracting Officer may direct.

(j) *Restoration of Contractor's Premises and Abandonment.* Unless otherwise provided herein, the Government:

(i) may abandon any Government property in place, and thereupon all obligations of the Government regarding such abandoned property shall cease; and

(ii) has no obligation to the Contractor with regard to restoration or rehabilitation of the Contractor's premises, neither in case of abandonment (paragraph (j)(i) above), disposition on completion of need or of the contract (paragraph (i) above), nor otherwise, except for restoration or rehabilitation costs which are properly included in an equitable adjustment under paragraph (b) above.

(k) *Communications.* All communications issued pursuant to this clause shall be in writing or in accordance with the "Manual for Military Standard Requisitioning and Issue Procedure (MILSTRIP) for Defense Contractors" (Appendix H, Armed Services Procurement Regulation). (ASPR 7-104.24(a))

71. VARIATIONS IN ESTIMATED QUANTITIES (1968 APR)

(The following clause is not applicable to bid items listed in the "Variations in Estimated Quantities – Subdivided Items" clause, and also is not applicable to contracts for dredging work which contain the "Variations in Estimated Quantities – Dredging" clause.)

Where the quantity of a pay item in this contract is an estimated quantity and where the actual quantity of such pay item varies more than fifteen percent (15%) above or below the estimated quantity stated in this contract, an equitable adjustment in the contract price shall be made upon demand of either party. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above one hundred fifteen percent (115%) or below eighty-five percent (85%) of the estimated quantity. If the quantity variation is such as to cause an increase in the time necessary for completion, the Contracting Officer shall, upon receipt of a written request for an extension of time within ten (10) days from the beginning of such delay, or within such further period of time which may be granted by the Contracting Oficer prior to the date of final settlement of the contract, ascertain the facts and make such adjustment for extending the completion date as in his judgment the findings justify. (ASPR 7-603.27)

72. PROGRESS CHARTS AND REQUIREMENTS FOR OVERTIME WORK (1965 JAN)

(a) The Contractor shall within 5 days or within such time as determined by the Contracting Officer, after date of commencement of work prepare and submit to the Contracting Officer for approval a practicable schedule, showing the order in which the Contractor proposes to carry on the work, the date on which he will start the several salient features (including procurement of materials, plant and equipment) and the contemplated dates for completing the same. The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion at any time. The Contractor shall enter on the chart the actual progress at such intervals as directed by the Contracting Officer, and shall immediately deliver to the Contracting Officer three copies thereof. If the Contractor fails to submit a progress schedule within the time herein prescribed, the Contracting Officer may withhold approval of progress payment estimates until such time as the Contractor submits the required progress schedule.

(b) If, in the opinion of the Contracting Officer, the Contractor falls behind the progress schedule, the Contractor shall take such steps as may be necessary to improve his progress and the Contracting Officer may require him to increase the number of shifts, or overtime operations, days of work, or the amount of construction plant, or all of them, and to submit for approval such supplementary schedule or schedules in chart form as may be deemed necessary to demonstrate the manner in which the agreed rate of progress will be regained, all without additional cost to the Government.

(c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this provision shall be grounds for determination by the Contracting Officer that the Contractor is not prosecuting the work with such diligence as will insure completion within the time specified. Upon such determination the Contracting Officer may terminate the Contractor's right to proceed with the work or any separable part thereof, in accordance with the clause of the contract entitled "Termination for Default – Damages for Delay – Time Extensions." (ASPR 7-603.48)

73. ENVIRONMENTAL LITIGATION (1974 NOV)(OCE)

(a) If the performance of all or any part of the work is suspended, delayed, or interrupted due to an order of a court of competent jurisdiction as a result of environmental litigation, as defined below, the Contracting Officer, at the request of the Contractor, shall determine whether the order is due in any part to the acts or omissions of the Contractor or a Subcontractor at any tier not required by the terms of this contract. If it is determined that the order is not due in any part to acts or omissions of the Contractor or a Subcontractor at any tier other than as required by the terms of this contract, such suspension, delay, or interruption shall be considered as if ordered by the Contracting Officer in the administration of this contract under the terms of the "Suspension of Work" clause of this contract. The period of such suspension, delay or interruption shall be considered unreasonable, and an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) as provided in that clause, subject to all the provisions thereof.

(b) The term "environmental litigation", as used herein, means a lawsuit alleging that the work will have an adverse effect on the environment or that the Government has not duly considered, either substantively or procedurally, the effect of the work on the environment. (ECI 7-671.10)

74. LOCAL AFFIRMATIVE ACTION PLAN (1972 DEC)(REVISED)

(a) As used in this clause:

(1) "Hometown Plan" or "Plan" means the formal agreement among contractors, unions, and minority representatives described in the solicitation from which this contract resulted;

(2) "the covered area" means the geographical area described in the solicitation from which this contract resulted;

(3) "Director, OFCC" means the Director, Office of Federal Contract Compliance, United States Department of Labor, or any person to whom he delegates authority; and

(4) "minority" means Negro, Spanish-surnamed American, Oriental, and American Indian, and includes both men and women.

(b) Whenever the Contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, he shall include in each such subcontract exceeding $10,000 the provisions of this clause and any applicable minority manpower utilization goals under this contract, which shall be adopted by his subcontractor, who shall with regard to his own employees and subcontractors be bound thereby to the full extent as if he were the Contractor.

(c) If the Contractor is signatory to the Plan either individually or through an association, his affirmative action program shall be in accordance with the Plan. In such case, paragraphs (a), (b), (c), (1) and (m) of this clause shall apply. However, to the extent that the Contractor, or any subcontractor at any tier, employs construction trades that are not covered by the Plan, all of the provisions of this clause shall apply. For the purposes of this paragraph (c), construction trades shall be considered not covered by the Plan: (i) if the Contractor violates a substantial requirement of the Plan or ceases to be signatory thereto; (ii) if the Director, OFCC, determines that the Plan is no longer an acceptable affirmative action plan; (iii) if the employing subcontractor is not or ceases to be signatory to the Plan, either individually or through an association; (iv) if the construction trade is not one of the trades participating in the Plan; or (v) if the construction trade, though participating, is not subject to a specific goal for minority manpower utilization and has not been exempted from such a goal by the Director, OFCC.

(d) If the Contractor is not signatory to the Plan, his affirmative action program shall be in accordance with this clause. However, if the Contractor subsequently becomes signatory to the Plan, his affirmative action program shall be in accordance with the Plan, subject to the provisions of paragraph (c) above.

(e) The Contractor shall make good faith efforts to meet at least the minimum minority manpower utilization goals set forth in the solicitation from which this contract resulted. These goals constitute a commitment of the manhours of employment and training of minority workers the Contractor will undertake in each construction trade as a percentage of the total manhours to be worked in that construction trade on all of the Contractor's construction work in the covered area during the term of this contract. The percentage of manhours for minority employment and training shall be substantially uniform throughout the term of this contract for each construction trade and for all projects. Minority employees or trainees shall not be transferred from employer-to-employer or from project-to-project for the sole purpose of meeting minority manpower utilization goals.

(f) Minority manpower utilization goals shall be satisfied, whenever possible, by employment of qualified minority journeymen; provided, however, that the Contractor shall comply with the "Apprentices and Trainees" clause of this contract.

(g) In order for the nonworking training hours of trainees to be counted in meeting the minority manpower utilization goals, such trainees must be employed by the Contractor during the training period, the Contractor must have made a commitment to employ the trainees at the completion of their training, and the trainees must be trained pursuant to established training programs which must be the equivalent, with respect to the nature, extent and duration of training offered, of the training programs provided for in the Plan.

(h) The Contractor shall take affirmative action to increase his minority manpower utilization, which action shall be at least as extensive and as specific as the following steps:

(i) Notify community organizations that the Contractor has employment opportunities available and maintain records of the organizations' response.

(ii) Maintain a file of the names and addresses of each minority worker referred to him and what action was taken with respect to each such referred worker. If such worker was neither sent to the union hiring hall for referral, nor employed by the Contractor, the Contractor's file should document this fact and the reasons therefor.

(iii) Promptly notify the Director, OFCC, when any union with whom the Contractor has a collective bargaining agreement has not referred to the Contractor a minority worker sent by the Contractor, or the Contractor has other information that the union referral process has impeded him in his efforts to meet his goal.

(iv) Participate in training programs in the area, especially those funded by the Department of Labor.

(v) Disseminate his EEO policy within his own organization by including it in any policy manual; by publicizing it in company newspapers, annual report, etc.; by conducting staff, employee and union representatives' meetings to explain and discuss the policy; by posting of the policy; and by specific review of the policy with minority employees.

(vi) Disseminate his EEO policy externally by informing, and discussing it with, all recruitment sources; by advertising in news media, specifically including minority news media; and by notifying, and discussing it with, all subcontractors and suppliers.

(vii) Make specific and constant personal (both written and oral) recruitment efforts directed at all minority organizations, schools with minority students, minority recruitment organizations and minority training organizations, within the Contractor's recruitment area.

(viii) Make specific efforts to encourage present minority employees to recruit their friends and relatives.

(ix) Validate all man specifications, selection

requirements, tests, etc.

(x) Make every effort to provide after-school, summer and vacation employment to minority youths.

(xi) Develop on-the-job training opportunities and participate and assist in any association or employer-group training programs relevant to the Contractor's employee needs consistent with his obligations under this Local Affirmative Action Plan clause.

(xii) Continually inventory and evaluate all minority personnel for promotion opportunities and encourage minority employees to seek such opportunities.

(xiii) Make sure that seniority practices, job classifications, etc., do not have a discriminatory effect.

(xiv) Make certain that all facilities and company activities are non-segregated.

(xv) Continually monitor all personnel activities to ensure that his EEO policy is being carried out.

(xvi) Solicit bids for subcontracts from available minority subcontractors engaged in the trades covered by his commitment, including circulation of minority contractor associations.

(i) The Contractor shall not, in any event, utilize the goals, timetables or affirmative action steps in such a manner as to cause or result in discrimination against any person on account of race, color, religion, sex or national origin.

(j) The Contractor shall be deemed to have met his commitment to the minority manpower utilization goals if he has not denied equal employment opportunity and if his minority manpower utilization rate meets the goals on the total of all of the Contractor's work in the covered area. The minority manpower utilization of subcontractors shall not be considered in determining whether the Contractor has met the minority manpower utilization goals. The Contractor shall not be found to be in noncompliance with the obligations of the affirmative action plan solely because of failure to meet the applicable minority manpower utilization goals. In the event of such a failure, the Contractor shall be given the opportunity to demonstrate that he has instituted all of the affirmative action steps specified in (h) above and has made every good faith effort to make these steps work toward the attainment of the goals, all to the purpose of expanding minority manpower utilization on all his projects in the covered area. If the Contractor meets the goals or if he can demonstrate that he has made every "good faith" effort to meet those goals, no formal sanctions or proceedings leading toward sanctions shall be instituted unless it is otherwise determined that he is not providing equal employment opportunity. If the Contractor has failed to comply with the requirements of Executive Order 11246, as amended, the implementing regulations, or his obligations hereunder, action will be taken to impose such sanctions as may be appropriate under the Executive Order and the regulations. When the Government proceeds with such formal action, it has the burden of proving that the Contractor has not met the requirements of his commitment hereunder, but proof of the Contractor's failure to meet the goals shall shift to him the requirement to come forward with evidence to show that he has met the "good faith" requirements of his commitment. It shall be no excuse that a union with which the Contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.

(k) In the event that any work or activity under this contract takes place in a year later than the latest year for which an acceptable range of minority manpower utilization was provided in the solicitation from which this contract resulted, the goals for said latest year shall apply.

(l) The Contractor, and his subcontractors at any tier, shall not enter into any subcontract or subcontract modification subject to Executive Order 11246 of September 24, 1965, as amended, with any person or firm debarred from, or who has been determined not to be a "responsible" bidder for, Government contracts and federally assisted construction contracts pursuant to the Executive Order. The Contractor, and his subcontractors at any tier, shall carry out such sanctions and penalties for violation of the Equal Opportunity clause of this contract, including suspension, termination and cancellation of existing subcontracts, as may be imposed or ordered by the Director, OFCC. The Contractor, or his subcontractors at any tier, shall be deemed to be in noncompliance with this clause, the Equal Opportunity clause, and Executive Order 11246, as amended, for any failure to carry out such sanctions and penalties.

(m) The Contractor shall keep records and file reports relating to the provisions hereof as may be required by the Government.

SUPERSEDEAS DECISION

STATE: Arizona COUNTY: Statewide
DECISION NUMBER: AZ77-5058 DATE: Date of Publication
Supersedes Decision No. AZ76-5109 dated November 26, 1976, in 41 FR 52189.
DESCRIPTION OF WORK: Building Construction (does not include single family homes and garden type apartments up to and including 4 stories), heavy and highway construction.

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	Education and/or Appr. Tr.
ASBESTOS WORKERS	$ 11.04	.50	$ 1.10		.02
BOILERMAKERS	13.175	.775	1.00	.50	.02
BRICKLAYERS: (Phoenix Area)					
Bricklayers; Manhole Builders; Stonemasons:					
Zone A (0-25 miles from the City Hall in Phoenix; Flagstaff and Yuma)	10.05	.65	.90		.06
Zone B (25-40 miles from the City Hall in Phoenix; and Williams AFB)	10.55	.65	.90		.06
Zone C (40-70 miles from the City Hall in Phoenix)	11.56	.65	.90		.06
Zone D (70-100 miles from City Hall in Phoenix)	12.06	.65	.90		.06
Zone E (100-200 miles from the City Hall in Phoenix)	12.56	.65	.90		.06
Zone F (200 miles and over from the City Hall in Phoenix)	13.07	.65	.90		.06
BRICKLAYERS: (Tucson Area)					
Bricklayers; Stonemasons:					
Zone A (0-15 miles from Tucson City limits)	10.42	.80	.80		.06
Zone B (Over 15 miles to 30 miles from Tucson City limits)	10.79	.80	.80		.06
Zone C (Over 30 miles to 40 miles from Tucson City limits)	11.17	.80	.80		.06
Zone D (Over 40 miles from Tucson City limits)	11.92	.80	.80		.06
Manhole Builders:					
Zone A (0-15 miles from Tucson City limits)	10.67	.80	.80		.06
Zone B (Over 15 miles to 30 miles from Tucson City limits)	11.04	.80	.80		.06
Zone C (Over 30 miles to 40 miles from Tucson City limits)	11.41	.80	.80		.06

DECISION NO. AZ77-5058 Page 2

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	Education and/or Appr. Tr.
BRICKLAYERS: (Tucson Area) (Cont'd)					
Manhole Builders: (Cont'd)					
Zone D (Over 40 miles from Tucson City limits)	$ 12.17	.80	.80		.06
CARPENTERS:					
(Central and Southern Areas):					
Carpenters; Drywall Applicators; Saw Filers; Shingler	9.785	.845	.955		.05
Floorlayers (finish); Pile-drivermen	10.07	.845	.955		.05
Millwrights	10.20	.845	.955		.05
(Northern Area)					
Carpenters; Drywall Applicator; Saw Filer; Shingler	11.66	.845	.955		.05
Floorlayers (finish); Pile-drivermen	11.945	.845	.955		.05
Millwrights	12.075	.845	.955		.05
CEMENT MASONS:					
(Apache, Coconino, Gila, Mohave, Navajo, Yavapai, Yuma and the Northern portions of Graham, Greenlee, Maricopa and Pinal Counties)					
(Central and Southern Areas)					
Cement Masons	9.51	.95	1.00		.05
Concrete troweling machine; Sawing and scoring machine; Curb and gutter machine	9.67	.95	1.00		.05
(Northern Area)					
Cement Masons	11.385	.95	1.00		.05
Concrete troweling machine; Sawing and scoring machine; Curb and gutter machine	11.545	.95	1.00		.05
(Cochise, Pima, Santa Cruz and the southern portions of Graham, Greenlee, Maricopa and Pinal Counties)					
(Central and Southern Areas)					
Cement Masons	10.22	.85	.85		.05
Concrete troweling machine; Sawing and scoring machine; Curb and gutter machine	10.385	.85	.85		.05

DECISION NO. AZ77-5058 Page 3

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	Education and/or Appr. Tr.
DRYWALL: (From Court House in Phoenix, Mesa, including Luke and Williams Air Force Bases)					
Tapers:					
Zone A (0-40 miles)	$ 9.71	.59	.50		.07
Zone B (41-60 miles)	10.71	.59	.50		.07
Zone C (61 miles and over)	11.96	.59	.50		.07
Texture Spraymen:					
Zone A (0-40 miles)	9.81	.59	.50		.07
Zone B (41-60 miles)	10.81	.59	.50		.07
Zone C (61 miles and over)	12.06	.59	.50		.07
ELECTRICIANS: (Flagstaff Area)					
Zone A (in the City of Flagstaff, that area lying in a square extending 20 miles North-South, East and West of the Post Office) (Williams, Winslow and Sedona covering a square extending 5 miles North-South, East and West of the Post Office in each town)					
Electricians	12.64	.96	1%+.70		1/2%
Cable Splicers	12.84	.96	1%+.70		1/2%
Zone B (All territoral jurisdiction allotted outside of Zone A)					
Electricians	14.94	.96	1%+.70		1/2%
Cable Splicers	15.14	.96	1%+.70		1/2%
ELECTRICIANS: (Gallup Area-Northern Apache County)					
Electricians	12.60	.60	1%+.70		1/2%
Cable Splicers	13.65	.60	1%+.70		1/2%
ELECTRICIANS: (Globe-Miami Area)					
Zone A (The area within 16 road miles beginning where the Southern Pacific Railroad intersects Highway 60-70 at Kaiser Crossing)					
Electricians	13.09	6%	9%		1/2%
Cable Splicers	13.34	6%	9%		1/2%

RW-2

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	Education and/or Appr. Tr.
ELECTRICIANS: (Globe-Miami Area) (Cont'd)					
Zone B (16-28 miles)					
Electricians	$ 13.79	6%	9%		1/2%
Cable Splicers	14.04	6%	9%		1/2%
Zone C (28-46 miles)					
Electricians	14.39	6%	9%		1/2%
Cable Splicers	14.64	6%	9%		1/2%
Zone D (46 miles and over)					
Electricians	15.89	6%	9%		1/2%
Cable Splicers	15.34	6%	9%		1/2%
ELECTRICIANS: (Phoenix)					
Zone A (Beginning at the northeast corner, a line extending southward on Bush Highway to McKellips Road; a line extending east on McKellips Road to a point one mile east of the intersection of State Highway 88 and U. S. 60 and 70 near Apache Junction; Southward to Baseline Road; west on Baseline Road to the intersection of Baseline Road and Ellsworth Road; South on Ellsworth Road to Hunt Highway; west on Hunt Highway to Powers Road; a line extending south on Powers Road five miles, then extending straight west to a point five miles west of Interstate 10, then northwest on a line parallel with Interstate 10 to intersect with Pecos Road, west on Pecos Road to intersect with Cotton Lane, North on Cotton Lane to Beloat Road. West on Beloat Road to Airport Road. North on Airport Road in a straight line to intersect Waddell Road. East on Waddell Road to intersect with Cotton Lane, North on Cotton Lane to Deer Valley Drive and east on Deer Valley Drive to intersect with Bush Highway including Luke and Williams Air Force Bases.)					

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	Education and/or Appr. Tr.
ELECTRICIANS: (Cont'd)					
Electricians	$ 12.84	.96	1%+.70		1/2%
Cable Splicers	12.64	.96	1%+.70		1/2%
Zone B (Area outside of Zone A and bounded by a line formed by measuring sixteen (16) road miles from the outer boundaries of an area enclosed by the following boundaries: Power Road on the east, from Hunt Highway on the south to one mile south of Pinnacle Peak Road on the north; One mile south Pinnacle Peak Road to Cotton Lane on the west; Cotton Lane to Pecos Road on the south. Pecos Road to Price Road and from Price Road to Hunt Highway on the south. Hunt Highway to Powers Road on the east)					
Electricians	14.15	.96	1%+.70		1/2%
Cable Splicers	14.85	.96	1%+.70		1/2%
Zone C (outside edge of Zone B and extended to the outside limits of the union's jurisdiction)					
Electricians	15.23	.96	1%+.70		1/2%
Cable Splicers	15.99	.96	1%+.70		1/2%
ELECTRICIANS: (Kingman)					
Zone A (The area within the 16th road mile from the City Hall)					
Electricians	12.84	.96	1%+.70		1/2%
Cable Splicers	12.64	.96	1%+.70		1/2%
Zone B (from the 16th road mile and extend up to and including the 32nd road mile)					
Electricians	14.15	.69	1%+.70		1/2%
Cable Splicers	14.85	.69	1%+.70		1/2%

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	Education and/or Appr. Tr.
ELECTRICIANS: (Kingman) (Cont'd)					
Zone C (From the 32nd road mile and extend up to the outside limits of the union's jurisdiction)					
Electricians	$ 15.23	.96	1%+.70		1/2%
Cable Splicers	15.99	.96	1%+.70		1/2%
ELECTRICIANS: (Prescott)					
Zone A (The area within 20 road miles from the City Hall)					
Electricians	12.04	.96	1%+.70		1/2%
Cable Splicers	12.64	.96	1%+.70		1/2%
Zone B (From the 20th road mile and extend up to and including the 32nd road mile)					
Electricians	14.15	.96	1%+.70		1/2%
Cable Splicers	14.85	.96	1%+.70		1/2%
Zone C (From the 32nd road mile and extend to the outside limits of the union's jurisdiction)					
Electricians	15.23	.96	1%+.70		1/2%
Cable Splicers	15.99	.96	1%+.70		1/2%
ELECTRICIANS: (Tucson Area)					
Zone A (Area within 16 road miles from the City Hall in Tucson and Douglas. Nogales and Sierra Vista shall be limited to 16 road miles from the center of the respective towns)					
Electricians	13.09	6%	9%		1/2%
Cable Splicers	13.34	6%	9%		1/2%
Zone B (Area from the outer limits of the 16 mile radius and extend up to and including 12 road miles)					
Electricians	13.79	6%	9%		1/2%
Cable Splicers	14.04	6%	9%		1/2%

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	Education and/or Appr. Tr.
ELECTRICIANS: (Tucson Area) (Cont'd)					
Zone C (Area from 12 road miles up to and including 30 road miles)					
Electricians	$ 14.39	5%	8%		1/2%
Cable Splicers	14.64	5%	8%		1/2%
Zone D (Area from 30 road miles and extend to the outside limits of the union's jurisdiction)					
Electricians	15.09	5%	8%		1/2%
Cable Splicers	15.34	5%	8%		1/2%
ELECTRICIANS: (Yuma Area)					
Zone A (Yuma North of Colorado River, East of County Avenue 5E, South to County 16th Street, and West to County Avenue E; Cities of Somerton and Parker)					
Electricians	11.88	.45	7%		1%
Cable Splicers	12.13	.45	7%		1%
Zone B (1-16 miles from Zone A)					
Electricians	12.58	.45	7%		1%
Cable Splicers	12.83	.45	7%		1%
Zone C (16-42 miles from Zone A)					
Electricians	13.18	.45	7%		1%
Cable Splicers	13.43	.45	7%		1%
Zone D (42 miles from Zone A and out)					
Electricians	13.88	.45	7%		1%
Cable Splicers	14.13	.45	7%		1%
ELEVATOR CONSTRUCTORS	11.55	.495	.32	3%+a	.02
ELEVATOR CONSTRUCTORS' HELPERS	70%JR	.495	.32	3%+a	.02
ELEVATOR CONSTRUCTORS' HELPERS (PROB.)	50%JR				
GLAZIERS	9.42	.70	.30		.01
IRONWORKERS:					
Central and Southern Areas	10.94	1.14	1.86		.08
Northern Area	12.94	1.14	1.86		.08
LATHERS: (Tucson Area)					
Zone A (0-30 miles from Tucson)	9.28	.35	.40		
Zone B (30-40 miles from Tucson)	9.78	.35	.40		
Zone C (40-50 miles from Tucson)	10.03	.35	.40		
Zone D (Area outside Zone C)	10.78	.35	.40		

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	Education and/or Appr. Tr.
PAINTERS: (Flagstaff Area)					
Zone A (From Falgstaff Court House to 20 miles)					
Brush; Soft Floor Layers	$ 9.73	.70	.60	.50	.20
Brush, steel and bridge	10.23	.70	.60	.50	.20
Spray	10.18	.70	.60	.50	.20
Spray, steel and bridge	10.73	.70	.60	.50	.20
Zone B (20-35 miles from Court House in Flagstaff)					
Brush; Soft Floor Layers	10.48	.70	.60	.50	.20
Brush, steel and bridge	10.98	.70	.60	.50	.20
Spray	10.93	.70	.60	.50	.20
Spray, steel and bridge	11.48	.70	.60	.50	.20
Zone C (35-80 miles from Court House in Flagstaff)					
Brush; Soft Floor Layers	11.48	.70	.60	.50	.20
Brush, steel and bridge	11.98	.70	.60	.50	.20
Spray	11.93	.70	.60	.50	.20
Spray, steel and bridge	12.48	.70	.60	.50	.20
Zone D (80 miles and over from Court House in Flagstaff)					
Brush; Soft Floor Layers	11.73	.70	.60	.50	.20
Brush, steel and bridge	12.23	.70	.60	.50	.20
Spray	12.18	.70	.60	.50	.20
Spray, steel and bridge	12.73	.70	.60	.50	.20
PAINTERS: (Phoenix Area)					
Zone A (0-40 miles from Court House in Phoenix, Mesa and including Luke and Williams Air Force Bases):					
Brush	9.69	.59	.38		.05
Spray	9.94	.59	.38		.05
Steel and bridge, brush	10.04	.59	.38		.05
Steel and bridge, spray	10.24	.59	.38		.05
Zone B (41-60 miles from Court House in Phoenix)					
Brush	10.69	.59	.38		.05
Spray	10.94	.59	.38		.05
Steel and bridge, brush	11.04	.59	.38		.05
Steel and bridge, spray	11.24	.59	.38		.05

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	Education and/or Appr. Tr.
PAINTERS: (Phoenix Area) (Cont'd)					
Zone C (60 miles and over from Court House in Phoenix)					
Brush	$ 11.69	.59	.38		.05
Spray	11.94	.59	.38		.05
Steel and bridge, brush	12.04	.59	.38		.05
Steel and bridge, spray	12.24	.59	.38		.05
PAINTERS: (Tucson and Yuma Areas)					
Zone A (0-30 miles from Stone and Congress in Tucson and from the County Courthouse in Yuma)					
Brush	8.78	.67	.35		.04
Spray	9.28	.67	.35		.04
Steel and bridge, brush	9.78	.67	.35		.04
Steel and bridge, spray	10.28	.67	.35		.04
Zone B (31-40 miles from Stone and Congress in Tucson and from the County Courthouse in Yuma)					
Brush	9.53	.67	.35		.04
Spray	10.03	.67	.35		.04
Steel and bridge, brush	10.53	.67	.35		.04
Steel and bridge, spray	11.03	.67	.35		.04
Zone C (41-50 miles from Stone and Congress in Tucson and from the County Courthouse in Yuma)					
Brush	10.03	.67	.35		.04
Spray	10.53	.67	.35		.04
Steel and bridge, brush	11.03	.67	.35		.04
Steel and bridge, spray	11.53	.67	.35		.04
Zone D (51 miles and over from Stone and Congress in Tucson and from the County Courthouse in Yuma)					
Brush	10.78	.67	.35		.04
Spray	11.28	.67	.35		.04
Steel and bridge, brush	11.78	.67	.35		.04
Steel and bridge, spray	12.28	.67	.35		.04

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	Education and/or Appr. Tr.
PLASTERERS: (Phoenix Area)					
Zone A (0-35 miles from Phoenix)	$ 9.045	.60	.85		.035
Zone B (35-60 miles from Phoenix)	9.795	.60	.85		.035
Zone C (60 miles and over from Phoenix)	10.67	.60	.85		.035
PLASTERERS: (Tucson Area)					
Zone A (0-30 miles from Tucson)	8.57	.35	.60		
Zone B (30-40 miles from Tucson)	9.07	.35	.60		
Zone C (40-50 miles from Tucson)	9.32	.35	.60		
Zone D (50 miles and over from Tucson)	10.07	.35	.60		
PLASTERERS' TENDERS:					
Central and Southern Areas	9.16	.85	.85		.10
PLUMBERS; Steamfitters:					
FREE ZONE 0-15 miles					
The "Free Zone" (Zone I) shall be 15 road miles from the stated base points in Flagstaff, Yuma, Tucson and Douglas. The "Free Zone" from Phoenix shall be 15 miles radius from the stated base point. In addition, all areas within the city limits of Phoenix, Chandler, Scottsdale, Tempe, Glendale, Mesa, Kingman, Havasu City, Prescott, Winslow and Holbrook will be included as Free Zones. Any work contracted for outside of these Zones will be determined from the Phoenix and Tucson basing points.					
Zone I (0-15 miles)	11.14	.75	1.35		.10
Zone II (15-30 miles)	11.49	.75	1.35		.10
Zone III (30-40 miles)	11.91	.75	1.35		.10
Zone IV (40 miles and over)	13.21	.75	1.35		.10

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	Education and/or Appr. Tr.
ROOFERS: (Tucson Area)					
Asbestos; Shinglers; Tile and Waterproofing:					
Zone A (0-44 miles from Tucson)	$ 8.97	.845	.20		.02
Zone B (Over 44 miles from Tucson)	10.72	.845	.20		.02
ROOFERS: (Phoenix Area)					
Roofers and Waterproofers	9.66	.845	.20		.02
SHEET METAL WORKERS:					
Zones Bases - from the Administration Building or City Hall in Flagstaff, Kingman, Phoenix, Prescott and Yuma):					
Zone I (0-25 miles)	10.43	3%+.70	1.10		.07
Zone II (25-50 miles)	11.08	3%+.70	1.10		.07
Zone III (50 miles and over)	12.93	3%+.70	1.10		.07
SHEET METAL WORKERS:					
Zone Bases - from the Administration Building or City Hall in Douglas and Tuscon:					
Zone A (0-22 miles)	9.99	3%+.94	1.91		.04
Zone B (22-45 miles)	10.94	3%+.94	1.91		.04
Zone C (Over 45 miles)	12.49	3%+.94	1.91		.04
SOFT FLOOR LAYERS: (Phoenix Area)					
Zone A (0-40 miles from Court House in Phoenix and Flagstaff including Luke and Williams Air Force Bases)	8.81	.49	.12		.12
Zone B (41-60 miles from Court House in Phoenix and Flagstaff)	9.81	.49	.12		.12
Zone C (61 miles and over from Court House in Phoenix and Flagstaff)	10.81	.49	.12		.12
SOFT FLOOR LAYERS: (Tucson Area)	9.25	.38			
SPRINKLER FITTERS	12.29	.69	.95		.08
TERRAZZO WORKERS; Tile Setters; Marble Mason: (Tucson Area)	9.42	.70	.75		

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	Education and/or Appr. Tr.
LINE CONSTRUCTION:					
Zone I (Phoenix and Tucson 30 mile radius from center of town):					
Groundmen	8.79	8%	8%		1/2%
Equipment Operators; Powdermen; Mechanics	10.15	8%	8%		1/2%
Linemen; Technicians; Crane Operators; Linemen Welder	11.45	8%	8%		1/2%
Cable Splicers	11.82	8%	8%		1/2%
Zone I-A (Douglas, Flagstaff, Globe, Kingman, Prescott and Yuma 10 mile radius from center of town):					
Groundmen	9.55	8%	8%		1/2%
Equipment Operators; Powdermen; Mechanics	10.85	8%	8%		1/2%
Linemen; Technicians; Crane Operators; Linemen Welder	12.20	8%	8%		1/2%
Cable Splicers	12.64	8%	8%		1/2%
Zone II (Other Areas):					
Groundmen	10.26	8%	8%		1/2%
Equipment Operators; Powdermen; Mechanics	11.57	8%	8%		1/2%
Linemen; Technicians; Crane Operators; Linemen Welder	12.93	8%	8%		1/2%
Cable Splicers	13.31	8%	8%		1/2%

FOOTNOTE:

a. Employer contributes 4% of basic hourly rate for 5 years' service and 2% basic hourly rate for 6 months to 5 years' service as Vacation Pay Credit. Six Paid Holidays: A through F.

PAID HOLIDAYS:

A-New Year's Day; B-Memorial Day; C-Independence Day; D-Labor Day; E-Thanksgiving Day; F-Christmas Day.

	Basic Hourly Rates C & S AREA	Basic Hourly Rates N AREA	Fringe Benefits Payments			
			H & W	Pensions	Vacation	Education and/or Appr. Tr.
LABORERS						
Group 1:	$ 8.01	$ 9.635	.85	.85		.10
Group 2:	8.14	9.765	.85	.85		.10
Group 3:	8.28	9.905	.85	.85		.10
Group 4:	8.39	10.015	.85	.85		.10
Group 5:	8.56	10.185	.85	.85		.10
Group 6:	8.935	10.56	.85	.85		.10
Group 7:	9.565	11.19	.85	.85		.10
LABORERS (Tunnel and Shaft Work)						
Group 1:	8.255	9.88	.85	.85		.10
Group 2:	8.42	10.045	.85	.85		.10
Group 3:	8.55	10.175	.85	.85		.10
Group 4:	8.91	10.535	.85	.85		.10
Group 5:	9.085	10.71	.85	.85		.10
Group 5A:	9.335	10.96	.85	.85		.10
POWER EQUIPMENT OPERATORS (Except Piledriving and Steel Erection)						
Group 1:	8.60	10.225	.95	.90		.06
Group 2:	8.97	10.595	.95	.90		.06
Group 3:	9.43	11.055	.95	.90		.06
Group 4:	9.96	11.585	.95	.90		.06
Group 5:	10.49	12.115	.95	.90		.06
Group 5A:	10.80	12.425	.95	.90		.06
Group 6:	11.13	12.755	.95	.90		.06
Group 7:	11.73	13.355	.95	.90		.06
TRUCK DRIVERS						
Group 1:	8.19	9.815	.85	.85		.06
Group 2:	8.32	9.945	.85	.85		.06
Group 3:	8.54	10.165	.85	.85		.06
Group 4:	8.89	10.515	.85	.85		.06
Group 5:	9.05	10.675	.85	.85		.06
Group 5A:	9.23	10.855	.85	.85		.06
Group 6:	9.37	10.995	.85	.85		.06
Group 7:	9.78	11.405	.85	.85		.06
Group 8:	10.295	11.92	.85	.85		.06
Group 8A:	10.95	12.575	.85	.85		.06
Group 8B:	10.64	11.265	.85	.85		.06
Group 8C:	8.75	10.375	.85	.85		.06

LABORERS

Group 1: All Helpers not herein separately classified; Cesspool Diggers and installers; Chat Box Man; Checker, tool dispatcher; Concrete dump manbelt, pipe and/or hoseman; Dumpman and/or spotter; Fence builder, guard rail builder highway; Form strippers; Labor, general or construction; Landscape gardener and nurseryman; Packing rod steel and pans; Rip rap stoneman; Astro turf layer; Cleanup, Bull gang; Trackman-railroad

Group 2: Cement finisher tender; Concrete curer (impervious membrane); Cutting torch operator; Fine grader (highway, engineering and sewer work only); Kettleman - Tarman; Power type concrete buggy

Group 3: Bander; Chucktender (except tunnel); Creosote tieman; Guinea chaser; Powderman helper; Rip-rap stone paver; Sandblaster (pot tender); Spiker and wrenchers

Group 4: Cement dumpers (Skip-type mixer or handling bulk cement); Chain saw machines (on clearing and grubbing); Concrete vibrating machines; Cribber and shorer (except tunnel); Floor sanders concrete; Hydraulic jacks, and similar mechanical tools not separately classified herein; Operators and tenders of penumatic and electric tools; Pipe caulker and/or backup man (pipeline); Pipe wrapper; Pneumatic gopher; Rigger/Signalman (pipeline)

Group 5: Air and water wash-out nozzleman; Asphalt rakers and ironers; Driller; Grade setter (pipeline); Hand guided trencher and similar operated equipment; Jackhammer and/or pavement breakers; Pipelayers (including but not limited to non-metallic, transite and plastic pipe, water pipe, sewer pipe, drain pipe, underground tile and conduit); Rock slinger; Scaler (using Bos'ns chairs or safety belt); Tampers (mechanical - all types); Precast manhole erector

Group 6: Concrete Cutting Torch; Concrete saw (hand guided); Driller, (core, diamond, wagon or air track); Drill doctor and/or air tool repairman; Gunman and mixerman (gunite); Sandblaster (nozzleman)

Group 7: Concrete Road Form Setter; Gunite nozzleman or rodman; Drillers, Joy Mustang, PR 143, 220 Gardner-Denver, Hydrasonic; Powderman; Scaler (drillers); Welders and/or pipelayers installing process piping; Form setter and/or builder

LABORERS
(Tunnel and Shaft Workers)

Group 1: Bull Gang, muckers, trackman; Dumpmen; Concrete crew (includes rodders and spreaders); Grout crew; Swamper (brakeman and switchmen on tunnel work); Change house man

Group 2: Nipper; Chucktender, Cabletender, Vibratorman, Jackhammer, Pneumatic tools (except driller)

Group 3: Grout Gunman

Group 4: Timberman, Retimberman - wood or steel blaster, driller powderman; Cherry pickerman; Powderman - primer house; Steel form raiser and setter; Kemper and other pneumatic concrete placer operator; Miner - finisher; Miners - Tunnel (hand or machine)

Group 5: Diamond Drill

Group 5A: Shaft and Raise Miner Welder

POWER EQUIPMENT OPERATORS
(Except Piledriving and Steel Erection)

Group 1: Air compressor operator; Field equipment servicemen helper; Heavy duty repair helper; Heavy duty welder helper; Oiler; Pump operator

Group 2: Conveyor operator; Generator operator - portable; Power grizzly operator; Self-propelled chip spreading machine - conveyor operator; Watch fireman; Welding machine operator - gasoline and diesel power

Group 3: Concrete mixer operator - skip type; Dinky operator - (under 20 tons wt.); Driver-moto paver, Slurry seal machine, and similar type equipment; Motor crane driver; Power sweeper operator - self-propelled; Ross carrier or fork lift operator; Skip loader operator - all types with rated capacity 1-1/2 cu. yds. or less; Wheel type tractor operator (Ford, Ferguson, or similar type) with attachments such as fresno, push blade, post hole auger, mower, etc., excluding compacting equipment

Group 4: A-Frame boom truck or winch truck operator; Asphalt plant firemen; Elevator hoist operator (including Tuskey hoist or similar types); Grade checker (excluding civil engineer); Multiple power concrete saw operator; Pavement breaker, mechanical compactor operator, power propelled; Roller operator - all types - except as otherwise classified; Screed operator; Self-propelled chip spreading machine operator (including Slurry seal machine operator) Stationary pipewrapping and cleaning machine operator; Tugger operator

Group 5: Aggregate plant operator (including crushing, screening and sand plants, etc.); Asphalt plant mixer operator; Beltcrete machine; Boring machine operator; Concrete mechanical tamping, spreading or finishing machine (incl. Clary, Johnson, or similar types); Concrete pump operator; Concrete batch plant operator, all types and sizes; Conductor, brakeman, or handler; Drilling machine, including water wells; Elevating grader operator - all types and sizes (except as otherwise classified); Field equipment serviceman; Highline cableway signalman; Kolman belt loader operator or similar, w/belt width 48" or over; Locomotive engineer (incl. Dinky-20 tons wt. and over); Moto-paver and similar type equipment operator; Operating engineer rigger; Pneumatic-tired scraper operator (Turnapull, Euclid, Cat, D-W, Hancock and similar equipment) up to and including 12 cu. yds.; Power jumbo form setter operator; Pressure grout machine operator (as used in heavy engineering construction); Road Oil mixing machine operator; Roller operator-on all types asphalt pavement; Self-propelled compactor, with blade; Skip loader operator-all types with rated capacity over 1-1/2 but less than 4 cu. yds.; Slip form operator (power driven lifting device for concrete forms); Soil cement road mixing machine operator - single pass type; Stationary Central generating plant operator-rated 300 k.w. or more; Surface heater and planer operator; Traveling pipewrapping machine operator

Group 5-A: Heavy duty mechanic and/or welder; Pneumatic tired scraper, all sizes and types over 12 cu. yds. up to and incl. 45 cu. yds. MRC (Turnapull, Euclid, Cat, D-W, Hancock and similar equipment); Tractor operator (Pusher,

POWER EQUIPMENT OPERATORS (Cont'd)
(Except Piledriving and Steel Erection)

Bulldozer, Scraper) up to 400 net horsepower rating; Trenching machine operator

Group 6: Auto-Grade Machine (CMI and similar equipment); Boring machine operator (including Mole, Badger and similar type); Concrete mixer operator-paving type, and mobile mixer; Concrete pump operator with boom attachment (Truck mounted); Crane operator-crawler and pneumatic type, under 100 ton capacity MRC; Crawler type tractor operator - with boom attachment; Derrick operator; Forklift operator for hoisting personnel; Grade-all operator; Helicopter hoist; Highline cableway operator (less than 20 tons rated capacity); Mass excavator operator (150 Bucyrus Erie and similar types); Mechanical hoist operator (two or more drums); Motor grade operator - any type power blade; Motor grade operator with elevating grader attachment; Mucking machine operator; Overhead crane operator; Piledriver engineer (portable, stationary or skid rig); Pneumatic-tired scraper operator - all sizes and types (Turnapull, Euclid, Cat, D-W, Hancock & similar equipment over 45 cu. yds., MRC); Power driven ditch lining or ditch trimming machine operator; Skip loader operator - all types with rated capacity 4 cu. yds., but less than 8 cu. yds.; Slip form paving machine operator (including Gunnert, Zimmerman & similar types); Specialized power digger operator- attached to wheel-type tractor; Tower crane (or similar type) operator; Tractor operator (Pusher, Bulldozer, Scraper (400 net horsepower and over; Tugger operator (two or more); Universal equipment operator-Shovel, Backhoe, Dragline, Clamshell, etc., up to 8 cu. yds.

Group 7: Crane operator - pneumatic or crawler (100 ton hoisting capacity and over MRC rating); Helicopter pilot - FAA qualified when used in construction work; Highline cableway operator, over 20 ton rated capacity and using traveling head and tail tower; Remote control earth moving equipment operator; Skip loader operator - all types with rate capacity of 8 cu. yds. or more; Universal equipment - Shovel, backhoe, dragline, clamshell, etc., 8 cu. yds. and over

TRUCK DRIVERS

Group 1: Teamsters; Pickups; Station Wagons; Manhaul driver

Group 2: Dump or flatrack (2 or 3 axle); Water truck (under 2500 gals.); Buggymobile (1 c. y. or less); Fireman; Bus drivers, ambulance driver, self-propelled street sweeper; Warehouseman

Group 3: Dump or flatrack (4 axle); Dumptor or dumpster (less than 7 c. y.); Water truck (2500 gals. but less than 4000 gals.)

Group 4: Dumptor or dumpster (7 c. y. but less than 16 c. y.); Dump or flatrack (5 axle); Water truck (4000 gals. and over); Slurry type equipment or leverman; Flaherty spreader or similar type equipment or leverman; Transit mix (8 c. y. or less)

Group 5: Dump or flatrack (6 axle); Transit mix (over 8 c. y. but less than 10.5 c. y.); Rock truck (i.e. Dart, Euclid and other similar type end dumps, single unit, less than 16 c. y.))

Group 5A: Oil tanker or spreader and/or bootman, retortman or leverman

Group 6: Transit mix (over 10.5 c. y. but less than 14 c. y.); Ross Carrier fork lift or lift truck; Hydro lift, Swedish Crane Iowa 300 and similar types; Concrete pump (when integral part of transit mix truck); Dump or flatrack (7 axle)

Group 7: Dump or Flatrack (8 axles)

Group 8: Off-Highway Equipment Driver including but not limited to: 2 or 4 wheel power unit, i.e., Cat DW Series, Euclid, International and similar type equipment, transporting material when top loaded or by external means including pulling water tanks, fuel tanks or other applications under Teamster Classifications; Rock trucks (Dart, Euclid, or other similar end dump types) 16 c. y. and over; Ejectalls; Dumptor or dumpster (16 c. y. and over); Dump or flatrack (9 axles)

Group 8A: Heavy duty mechanic/welder; Body and fender man

Group 8B: Field Equipment serviceman or fuel truck driver

Group 8C: Heavy duty mechanic/welder helper

DECISION NO. AZ77-0058 - Mod. #1
(42 FR 31056 - June 17, 1977)
Statewide, Arizona

Change:

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	Education and/or Appr. Tr.
Bricklayers (Tucson Area):					
Bricklayers, Stonemasons:					
Zone A	$ 10.82	.90	.85		.06
Zone B	11.19	.90	.85		.06
Zone C	11.56	.90	.85		.06
Zone D	12.32	.90	.85		.06
Manhole Builders:					
Zone A	11.07	.90	.85		.06
Zone B	11.44	.90	.85		.06
Zone C	11.81	.90	.85		.06
Zone D	12.57	.90	.85		.06
Electricians (Phoenix, Kingman and Prescott Areas)					
Zone A	12.24	.96	3%+.78		3/4%
Zone B	14.38	.96	3%+.78		3/4%
Zone C	15.48	.96	3%+.78		3/4%
Electricians (Tucson Area)					
Zone A					
Electricians	13.09	6%	3%+8%		1/2%
Cable Splicers	13.34	6%	3%+8%		1/2%
Zone B					
Electricians	13.79	6%	3%+8%		1/2%
Cable Splicers	14.04	6%	3%+8%		1/2%
Zone C					
Electricians	14.39	6%	3%+8%		1/2%
Cable Splicers	14.64	6%	3%+8%		1/2%
Zone D					
Electricians	15.09	6%	3%+8%		1/2%
Cable Splicers	15.34	6%	3%+8%		1/2%
Line Construction:					
Zone I (Phoenix and Tucson 30 mile radius from center of town)					
Groundmen	9.67	8%	3%+7%		1/2%
Equipment Operators; Powdermen; Mechanics	11.17	8%	3%+7%		1/2%
Linemen; Technicians; Crane Operators; Linemen Welder	12.60	8%	3%+7%		1/2%
Cable Splicers	13.00	8%	3%+7%		1/2%
Zone I-A (Douglas, Flagstaff, Globe, Kingman, Prescott and Yuma 10 mile radius from center of town)					
Groundmen	$ 10.51	8%	3%+7%		1/2%
Equipment Operators; Powdermen; Mechanics	11.94	8%	3%+7%		1/2%
Linemen; Technicians; Crane Operators; Linemen Welder	13.42	8%	3%+7%		1/2%
Zone II (Other areas):					
Groundmen	11.29	8%	3%+7%		1/2%
Equipment Operators; Powdermen; Mechanics	12.73	8%	3%+7%		1/2%
Linemen; Technicians; Crane Operators; Linemen Welder	14.22	8%	3%+7%		1/2%
Cable Splicers	14.65	8%	3%+7%		1/2%

Reference
DACW09-77-B-0031

SPECIFICATIONS

for

CAVE BUTTES DAM

PHOENIX, ARIZONA

Gila River Basin,

New River and Phoenix City Streams, Arizona

Appropriation: 96x3122 Construction General
Corps of Engineers, Civil

U S Army Engineer District
Los Angeles
Corps of Engineers

TABLLE OF CONTENTS

PART I SPECIAL PROVISIONS

PART II TECHNICAL PROVISIONS

Section	Title
1A	General Requirements
1B	Measurement and Payment
1D	Environment Protection
2A	Diversion and Control of Water
2B	Clearing and Grubbing
2F	Detour
2J	Stripping
3A	Excavation
3B	Fills and Subgrade Preparation
3C	Embankments and Foundation Preparation
4A	Concrete Construction
4C	Precast-Prestressed Concrete Girders
4H	Grouting Stone Protection
4J	Drilling and Grouting
5B	Reinforced Masonry
5C	Stone Veneer
5D	Stone Protection
6A	Miscellaneous Metalwork and Materials
6D	Fences
8D	Culverts
8E	Reinforced Concrete Pipe Conduit
9A	Aggregate Base
9D	Prime Coat
9G	Asphalt Concrete
9L	Guardrail, Wheel Bumpers and Traffic Signs
10A	Seeding
10B	Trees, Shrubs, and Cacti
11A	Gages and Monuments
14A	Built-Up Roofing
14B	Steel Doors and Frames
14D	Carpentry
14F	Metal Toilet Doors
14H	Painting, General
15B	Toilet Facilities

PART I

SPECIAL PROVISIONS

Index

1. Commencement, Prosecution, and Completion of Work
2. Liquidated Damages
3. Contract Drawings, Maps and Specifications
4. Contractor Submittals
5. Physical Data
6. Salvage Materials and Equipment
7. Layout of Work
8. Quantity Surveys
9. Damage to Work
10. Performance of Work by Contractor
11. Contractor Quality Control
12. Los Angeles City License Taxes
13. Progress Schedule
14. Variation In Estimated Quantities-Subdivided Items
15. Time Extension
16. Funds Available for Payments
17. Listed Aggregate Sources
18. Identification of Government-Furnished Property

1. COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK. (1965 JAN.) The Contractor will be required to commence work under this contract within 10 calendar days after the date of receipt by him of notice to proceed, to prosecute said work diligently, and to complete the entire work ready for use not later than 710 calendar days after the date of receipt of notice to proceed except seeding and planting. Seeding and planting shall be accomplished as soon as practicable and within time limits stated in the Technical Provisions or directed by the Contracting Officer. The time stated for completion shall include final clean-up of the premises.

2. LIQUIDATED DAMAGES. (1965 JAN.). In case of failure on the part of the Contractor to complete the work within the time fixed in the contract or any extensions thereof, the Contractor shall pay the Government as liquidated damages, pursuant to the clause of this contract entitled "Terminations for Default-Damages for Delay-Time Extensions," the sum of $165.00 for each day of delay.

3. CONTRACT DRAWINGS, MAPS AND SPECIFICATIONS. (1965 JAN.).

3.1 Ten sets of large scale contract drawings, maps and specifications will be furnished the Contractor without charge, except for applicable publications incorporated into the Technical Provisions by reference. Additional sets will be furnished on request at the cost of reproduction. The work shall conform to the following contract drawings and maps, all of which form a part of these specifications and are available in the office of the U. S. Army Engineer District, Los Angeles, 300 North Los Angeles Street, Los Angeles, California.

Drawing No. (District File No.)	Title
244/1	Index To Contract Drawings
244/2	Project Location
244/3	General Plan
244/4	General Plan of Geologic Exploration
244/5	General Site Geology and Plan of Geologic Exploration
244/6	Geologic Sections – Dam Dikes No. 1 and No. 2, Spillway, and Outlet Works
244/7	Geologic Logs – Sheet I
244/8	Geologic Logs – Sheet II
244/9	Grouting – Plans and Sections
244/10	Seismic Refractive Survey – Plan
244/11	Seismic Refractive Survey – Sections and Time-Distance Graphs, Sheet I
244/12	Seismic Refractive Survey – Sections and Time-Distance Graphs, Sheet II
244/13	Dam Foundation – Plan of Soils Exploration
244/14	Dikes No. 1 and No. 3, and Spillway Foundation – Plan of Exploration
244/15	Dike No. 2 Foundation and Zone II Material Borrow Area – Plan of Exploration
244/16	Zone I Material Borrow Area – Plan of Exploration
244/17	Zone II Material Borrow Area – Plan of Exploration
244/18	Zone III Material Borrow Area – Plan of Exploration
244/19	Dam, Dikes No. 1 and No. 3, and Spillway Foundation Exploration – Soil Logs
244/20	Dike No. 2 Foundation and Zone II Material Borrow Area Exploration – Soil Logs

Drawing No. (District File No.)	Title
244/21	Dike No. 2 Foundation and Zone II Material Borrow Area Exploration – Soil Logs
244/22	Dike No. 2 Foundation and Zone II Material Borrow Area Exploration – Soil Logs
244/23	Zone I Material Borrow Area Exploration – Soil Logs
244/24	Zone I Material Borrow Area Exploration – Soil Logs
244/25	Zone II Material Borrow Area Exploration – Soil Logs
244/26	Zone II Material Borrow Area Exploration – Soil Logs
244/27	Zone III Material Borrow Area Exploration – Soil Logs
244/28	Zone III Material Borrow Area Exploration – Soil Logs
244/29	Zone III Material Borrow Area Exploration – Soil Logs
244/30	Dam and Dike No. 1 Embankments, Plan and Profile
244/31	Dam and Dike No. 1 Embankments, Cross Sections Sheet I
244/32	Dam and Dike No. 1 Embankments, Cross Sections Sheet II
244/33	Dam Embankment-Streambed, Abutments and Cutoff Trench Excavation, Plan and Sections
244/34	Dam and Dike No. 1 Embankments, Instrumentation
244/35	Details of Monuments and Staff Gage
244/36	Reservoir Water Surface Recording Facilities
244/37	Dike No. 2 – Plan and Profile, Sta. 50+23 to Sta. 82+00
244/38	Dike No. 2 – Plan and Profile, Sta. 82+00 to Sta. 113+00
244/39	Dike No. 2 – Plan and Profile, Sta. 113+00 to Sta. 140+50
244/40	Dike No. 2 – Cross Sections, Sheet I
244/41	Dike No. 2 – Cross Sections, Sheet II
244/42	Dike No. 2 – Instrumentation, Sta. 50+23 to Sta. 82+00
244/43	Dike No. 2 – Instrumentation, Sta. 82+00 to Sta. 113+00
244/44	Dike No. 2 – Instrumentation, Sta. 113+00 to Sta. 140+00
244/45	Dike No. 3 – Plan Profile and Sections
244/46	Spillway – Plan and Profile
244/47	Spillway – Cross Sections
244/48	Spillway – Rock Excavation Details
244/49	Outlet Works – Plan and Profile, Sta. 60+00 to Sta. 46+80
244/50	Outlet Works – Plan and Profile, Sta. 46+80 to Sta. 33+76
244/51	Outlet Works – Cross Sections
244/52	Outlet Works – Rock Excavation Details
244/53	Outlet Works – Intake Structure Details
244/54	Outlet Works – Retaining Wall and Conduit Details
244/55	Outlet Works – Energy Dissipator and Structural Details
244/56	Outlet Works – Bridge at Gaging Station
244/57	Fencing, Double Drive Gates, Guard Rail, and Turnaround Details
244/58	Drainage Channel – Plan, Profile and Details
244/59	Access Road – Plan, Profile and Details Sta. 95+00 to Sta. 116+00
244/60	Access Road – Plan, Profile and Details Sta. 116+00 to Sta. 140+20
244/61	Access Road – Plan, Profile and Details Sta. 9+26 to Sta. 70+00
244/62	Access Road – Plan, Profile and Details Sta. 70+00 to Sta. 118+80.84
244/63	Access Road – Culverts and Structural Details
244/64	Overlook Area – General Plan
244/65	Overlook Area – Restroom Plan, Section and Details
244/66	Overlook Area – Restroom, Plans and Structural Details
244/67	Overlook Structure, Plan, Section and Details
244/68	Overlook Road – Plan and Profile, Sta. 55+72.85 to Sta. 110+03.11
244/69	Overlook Road – Plan and Profile, Sta. 110+03.11 to Sta. 169+08.18
244/70	Esthetic Treatment Borrow Areas
244/71	Esthetic Treatment - Dam, Dikes No. 1 and No. 2, Embankments
244/72	Esthetic Treatment - Dike No. 2 and Cave Creek Road Embankments
244/73	Esthetic Treatment - Embankment Sections and Details

Drawing No. (District File No.)	Title
244/74	View Point Slab - Plan and Details
244/75	Permanent Project Sign
244/76	Planter Planting Plan and Details
244/77	Bypass Channel – Geology, Seismic Refractive Survey, Time-Distance Curves
244/78	Bypass Channel – Plan, Profile and Sections
244/79	Cave Creek Road Modification Plan and Profile

3.2 Omissions from the drawings or specifications or the misdescription of details of work which are manifestly necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed details of the work but they shall be performed as if fully and correctly set forth and described in the drawings and specifications.

3.3 The Contractor shall check all drawings furnished him immediately upon their receipt and shall promptly notify the Contracting Officer of any discrepancies. Figures marked on drawings shall in general be followed in preference to scale measurements. Large scale drawings shall in general govern small scale drawings. The Contractor shall compare all drawings and verify the figures before laying out the work and will be responsible for any errors which might have been avoided thereby.

4. CONTRACTOR SUBMITTALS.

4.1 General. Reference is made to the General Provision entitled Shop Drawings. The Contractor shall submit for approval all shop drawings, certificates of compliance and/or equipment lists called for under the various headings of these specifications. These drawings, certificates and lists shall be complete and detailed. If approved by the Contracting Officer, each copy of the drawings, certificates, or lists will be identified as having received such approval by being so stamped and dated. The Contractor shall make any corrections required by the Contracting Officer. Unless otherwise specified in the Technical Provisions, the number of copies to be submitted shall be as stated herein. The Contractor shall complete ENG Form 4025, "Transmittal of Shop Drawings, Equipment Data, Material Samples, or Manufacturer's Certificates of Compliance for Approval" and forward 6 copies of same with each set of shop drawings, certificates of compliance, or equipment lists submitted. Blank ENG Forms 4025 will be furnished by the Contracting Officer on request. Each shop drawing submitted for approval shall have, in the lower right hand corner just above the title, a white space 3 inches x 4 inches in which the Contracting Officer can indicate the action taken. Shop drawings for submittal shall be either blue line or black line prints on a white background. Blueprints are not acceptable. Each shop drawing, certificate of compliance, and/or equipment list shall be identified with the following information as applicable:

Contract Number
Project Title and Location
Subcontractor's Name
Supplier's Name
Manufacturer's Name
Contract Specification and Paragraph Number
Contract Drawing File Number

4.1.1 Contractor Certification. Each submittal of the shop drawings shall contain the following certification on the face of the ENG Form 4025 accompanying the submittal:

"I have reviewed the shop drawings in detail
and they are correct and in strict conformance
with the contract drawings and specifications
except as otherwise explicitly stated.

Authorized Prime Contractor Representative"

4.2 Shop Drawings and Materials Submittal Register. Within 15 calendar days after commencement of work under this contract, the Contractor shall submit a preliminary register showing all shop drawings, certificates of compliance, equipment lists, samples, and other data required to be submitted under the various headings of these specifications. The register shall be submitted in duplicate. The preliminary register shall show the submittal identification number, the type of submittal, and the description for all items to be submitted under this contract and, for all items needed prior to submittal of the Project Progress Schedule, the scheduled submittal date, approval need date, and the material/equipment need date shall also be included. The register shall be expanded to include all Contractor scheduled dates and shall be resubmitted within 15 calendar days after submittal of the project progress schedule. After original approval the register shall be updated to indicate actual dates, actions completed, and any additional submittals or resubmittals required, and two copies of all updated sheets shall be submitted on or before

the fifteenth of each month. The register shall provide adequate time for review and approval of the submitted material and shall be coordinated with the construction progress schedule to assure that all equipment and materials will be available for incorporation into the work in accordance with approved schedule of construction operations. Payment for materials incorporated into the work will not be allowed until required approvals have been obtained.

4.3 Shop Drawings. The Contractor shall submit to the Contracting Officer for approval 10 copies of all shop drawings as called for under the various headings of these specifications. Eight sets of all shop drawings will be retained by the Contracting Officer and one set will be returned to the Contractor.

4.4 Certificates of Compliance. (1969 MAY OCE) Any certificates required for demonstrating proof of compliance of materials with specification requirements shall be executed in 6 copies. Each certificate shall be signed by an authorized officer of the manufacturing company and shall contain the name and address of the Contractor, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the tests to which the report applies. Certification shall not be construed as relieving the Contractor from furnishing satisfactory material, if, after tests are performed on selected samples, the material is found not to meet the specific requirements.

4.5 Resubmittals. If a submittal is returned for correction or is not satisfactory and is disapproved by the Contracting Officer, the Contractor shall resubmit the corrected material in the same quantity, as specified for the original submittal, for approval within 14 calendar days after receipt by him of the disapproved material.

5. PHYSICAL DATA. (1965 JAN.).

5.1 General. Information and data furnished or referred to below are furnished for the Contractor's information. However, it is expressly understood that the Government will not be responsible for any interpretation or conclusion drawn therefrom by the Contractor.

5.2 The physical conditions indicated on the drawings and in the specifications are the result of site investigations by survey, test trenches, borings and seismic surveys.

5.3 Weather Conditions.

5.3.1 Average temperature for period of record from 1951 to 1970 (20 years) inclusive at Phoenix, Arizona.

Month	Average Daily Maximum	Average Daily Minimum	Average	Maximum	Minimum
Jan	61.4	38.6	51.8	85	20
Feb	68.9	41.3	55.1	89	26
March	74.0	45.5	59.8	92	25
April	82.8	52.3	67.6	101	37
May	92.3	60.9	76.6	113	40
June	101.4	69.1	85.3	116	51
July	104.3	78.5	94.1	118	57
Aug	101.6	76.9	89.2	114	61
Sep	97.8	69.7	83.8	110	47
Oct	87.7	57.8	72.7	102	38
Nov	70.4	46.3	60.2	92	29
Dec	65.9	39.2	52.6	82	18

5.3.2 Hydrological Data. The following hydrological data were obtained from the U.S. Weather Bureau records for Phoenix, Arizona. The number of rainy days does not include days with only a trace of rainfall recorded.

LIBRARY

Month	1951 No. of Rainy Days	1951 Rainfall	1952 No. of Rainy Days	1952 Rainfall	1953 No. of Rainy Days	1953 Rainfall	1954 No. of Rainy Days	1954 Rainfall	1955 No. of Rainy Days	1955 Rainfall
Jan	4	1.58	3	.56	2	.23	4	.88	8	2.41
Feb	5	.29	3	.29	2	.53	2	.58	1	.09
Mar	3	.44	7	2.20	2	.74	4	1.22	0	0
Apr	6	1.02	7	1.94	2	.02	1	.02	0	0
May	2	.20	0	0	2	.71	1	.11	1	.02
Jun	0	0	2	.06	0	0	1	.02	2	.95
Jul	5	1.06	6	.54	6	.88	7	.36	9	4.19
Aug	6	5.56	2	1.11	3	.31	5	.55	7	1.80
Sep	1	.33	4	.23	0	0	3	.44	0	0
Oct	3	.52	0	0	0	0	2	.12	1	.13
Nov	2	.73	6	3.04	1	.07	0	0	2	.05
Dec	6	.64	5	.68	1	.07	1	.01	1	.18
Total	43	12.37	45	10.65	21	3.56	31	4.31	32	9.82

Month	1956 No. of Rainy Days	1956 Rainfall	1957 No. of Rainy Days	1957 Rainfall	1958 No. of Rainy Days	1958 Rainfall	1959 No. of Rainy Days	1959 Rainfall	1960 No. of Rainy Days	1960 Rainfall
Jan	3	.67	10	1.57	2	.07	2	.23	4	.85
Feb	6	.64	5	.21	4	1.15	4	.63	2	.04
Mar	0	0	3	.53	9	1.94	0	0	1	.57
Apr	1	.03	2	.12	4	.89	1	.05	0	0
May	0	0	3	.43	2	.05	0	0	0	0
Jun	1	.01	1	.26	2	.05	0	0	0	0
Jul	4	.92	3	.72	2	.01	1	.45	2	.25
Aug	5	.46	5	.85	8	.72	8	1.36	5	.82
Sep	1	.02	0	0	7	2.25	1	.04	2	.12
Oct	2	.06	8	2.66	3	.50	3	1.75	5	.67
Nov	0	0	2	.02	1	.16	3	.43	0	0
Dec	1	.01	2	.23	0	0	7	3.46	1	.07
Total	24	2.82	44	7.60	44	8.12	30	8.40	22	3.39

Month	1961 No. of Rainy Days	1961 Rainfall	1962 No. of Rainy Days	1962 Rainfall	1963 No. of Rainy Days	1963 Rainfall	1964 No. of Rainy Days	1964 Rainfall	1965 No. of Rainy Days	1965 Rainfall
Jan	5	.23	8	1.20	3	.55	2	.22	5	1.22
Feb	1	.01	10	.83	2	1.16	1	.01	3	.91
Mar	4	.41	3	.50	2	.30	4	.37	5	1.39
Apr	0	0	0	0	1	.33	1	.10	5	1.35
May	0	0	0	0	0	0	0	0	1	.16
Jun	0	0	2	.12	0	0	0	0	2	.91
Jul	4	.40	1	.10	1	.03	5	.60	4	.16
Aug	10	2.11	2	.25	10	2.68	5	1.29	3	.18
Sep	1	.22	4	.39	0	0	5	1.80	4	.60
Oct	2	.08	0	0	4	1.46	3	.17	2	.20
Nov	2	.12	1	.03	5	.73	2	.35	4	.92
Dec	5	.85	4	.48	0	0	3	1.09	11	3.19
Total	35	4.43	35	3.90	28	7.24	31	6.00	49	11.19

LIBRARY

Month	1966 No. of Rainy Days	1966 Rainfall	1967 No. of Rainy Days	1967 Rainfall	1968 No. of Rainy Days	1968 Rainfall	1969 No. of Rainy Days	1969 Rainfall	1970 No. of Rainy Days	1970 Rainfall
Jan	3	.35	1	.25	3	.19	7	1.37	0	0
Feb	4	.95	0	0	6	1.20	8	.78	2	.30
Mar	2	.34	2	.43	4	1.04	3	.56	5	2.26
Apr	0	0	2	.08	0	0	2	.03	0	0
May	0	0	2	.05	0	0	2	.26	0	0
Jun	2	.22	3	.47	0	0	0	0	0	0
Jul	3	.09	5	.99	8	1.70	5	.28	2	.48
Aug	4	2.17	2	.02	6	.59	6	.14	8	1.02
Sep	6	2.00	4	.13	0	0	6	2.11	4	2.85
Oct	3	.25	2	.67	1	.35	1	.08	3	.44
Nov	2	.38	6	1.27	3	.91	6	.65	1	.02
Dec	4	.52	7	3.98	3	.69	5	.68	4	.26
Total	33	7.27	36	8.34	34	6.67	51	6.94	29	7.63

1951-1970

Month	Total for Period of Record: No. Rainy Days	Total for Period of Record: Rainfall	Mean for Period of Record: No. Rainy Days	Mean for Period of Record: Rainfall
Jan	79	14.63	4.0	0.73
Feb	71	10.60	3.6	0.53
Mar	63	15.24	3.2	0.76
Apr	35	5.98	1.8	0.30
May	16	2.02	0.8	0.10
Jun	18	3.07	0.9	0.15
Jul	83	14.51	4.2	0.73
Aug	110	23.99	5.5	1.20
Sep	54	13.53	2.7	0.68
Oct	48	10.11	2.4	0.51
Nov	49	9.88	2.4	0.49
Dec	71	17.09	3.6	0.85
Total	697	140.65	34.8	7.03

5.4 Transportation Facilities. The Southern Pacific Company serves the area adjacent to the site of the work. The Contractor shall investigate the availability of sidings and shall make all arrangements with the railroad company for any siding, spurs, or other facilities necessary for the delivery of materials to be used on the work. The Contractor shall make his own investigation of the condition of available public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress at the site of the work. It shall be the Contractor's responsibility to construct and maintain at his own expense, any haul roads required for construction operations.

5.5 Additional Information, including but not necessarily limited to, results of laboratory tests of material encountered in test holes or other explorations and field logs is available for inspection and study in the office of the District Engineer, Foundations and Materials Branch, 300 North Los Angeles Street, Los Angeles, California.

6. SALVAGE MATERIALS AND EQUIPMENT. (1965 JAN.). The Contractor shall maintain asequate property control records for all materials or equipment specified to be salvaged. These records may be in accordance with the Contractor's system of property control, if approved by the property administrator. The Contractor shall be responsible for the adequate storage and protection of all salvaged materials and equipment and shall replace, at no cost to the Government, all salvaged materials and equipment which are broken or damaged during salvage operations as the result of his negligence, or while in his care.

7. LAYOUT OF WORK. (1965 APR OCE)

7.1 The Government will establish the following base lines and bench marks at the site of the work:

a. Base Line. Control points in the vicinity of the dam, dikes and appurtenances.

b. Bench Marks.

STATION	LOCATION	ELEVATION
3706	At Paradise Valley, Arizona. About 16 mi. North of downtown Phoenix, Arizona From Bell Rd. & Cave Creek Rd. intersection. Go North on Cave Creek Rd. 3.55 mi. Continue to N-E on Cave Creek Rd. 1.45 mi. to intersection of dirt road running E-W & parallel to power line. Turn left on this dirt Rd. & go due West 0.22mi. Turn right onto jeep trail & bear to N & E. Go. 0.31 mi. Point is north easterly 375 feet in open ground. Set 5/8" rebar with aluminum Cap 0.2 ft. above ground. Stamped "USCE, L.A. Dist. 1969-3706."	1621.56
3709	At Paradise Valley, Arizona. About 16 mi. North of downtown Phoenix, Arizona From Bell Rd. & Cave Creek Rd. intersection. Go North on Cave Creek Rd. 3.55 mi. Continue to N-E on Cave Creek Rd. 2.03 mi. Point is set flush in Eastern edge A. C. paving. Set 5/8" rebar with aluminum Cap. flush to pavement. Stamped "USCE, L.A. Dist. 1969-3709."	1646.84
3760	At Paradise Valley, Arizona. 16 mi. North of downtown Phoenix, Arizona. From Bell Rd. & Cave Creek Rd. intersection. Go North on Cave Creek Rd. 5.00 mi. to intersection with power line & graded dirt Rd. E & W. Turn left & go 2.19 mi. due West on power line Rd. to intersection with N-S jeep Rd. Turn right & go Northerly on jeep Rd. 0.48 mi. Point is due East 160 ft. on open ground. Set 5/8" rebar with aluminum Cap 0.1 ft. above ground. Stamped. "USCE, L.A. Dist. 1969-3760."	1615.46
5240	At Paradise Valley Arizona. Approximately 19 mi. North of downtown Phoenix, from the intersection of E. Bell Rd. & N. Cave Creek. Go N. 6.2 mi. to a well-graded dirt Rd. on the left. Turn left for 1.8 mi. to a dirt Rd. Turn right approx. 0.53 mi. to the corner of a 4 strand barbed wire fence. Continue N. N.W. to a fork. Take the left fork to trail going N. N.W. Follow this trail approx. 1.0 mile through a large wash then a smaller one. Continue N. N.W. approx. 0.6 mi. then turn left 300 ft.	1669.08

STATION	LOCATION	ELEVATION
	Set aluminum cap & 5/8 rebar in concrete flush with ground stamped. "L.A. Dist. USCE, 5240 1970."	
5241	At Paradise Valley, Arizona.	1682.45
	Approx. 19 mi. N. of downtown Phoenix. From the intersection of E. Bell Rd. & North Cave Creek Rd. Go North 6.2 mi. to a well-graded dirt Rd. on the left. Turn left for 1.8 mi. to the intersection of a well-traveled dirt Rd., turn right approx. 0.53 mi. to the corner of a 4 strand barbed wire fence. Continue N. N.W. 0.1 mi. to a Fork. Take the Left Fork of Trail going N. N.W. Follow this trail approx. 1.0 mi. through a large wash then a smaller wash, continue N. N.W. approx. 0.6 mi. thence turn left approx. 0.5 mi.	
	Set aluminum cap & 5/8 rebar in concrete flush with ground stamped. "L.A. Dist. USCE, 5241 1970."	
5242	At Paradise Valley, Arizona.	1696.45
	Approx. 19 mi. North of downtown Phoenix. From the intersection of E. Bell Rd. & N. Cave Creek Rd. go 6.2 mi. to a well-graded dirt Rd. on the left. Turn left for 1.8 mi. to the intersection of a well-traveled dirt Rd. Turn right approx. 0.53 mi. to the corner of a 4 strand barded wire fence continue N. N.W. 0.1 mile to a fork. Take the left fork of trail going N. N.W. Follow this trail approx. 0.8 mi. through a large wash then a smaller wash. Turn N. approx. 1.0 mi., thence left 140 ft.	
	Set aluminum cap & 5/8 rebar in concrete flush with ground stamped. "L.A. Dist. USCE, 5242 1970."	

c. All necessary information relating to lines and grades will be made available to the Contractor.

7.2 From the base lines and bench marks established by the Government, the Contractor shall complete the layout of the work and shall be responsible for all measurements that may be required for the execution of the work to the location and limit marks prescribed in the specifications or on the contract drawings, subject to such modifications as the Contracting Officer may require to meet changed conditions or as a result of necessary modifications to the contract work.

7.3 The Contractor shall furnish, at his own expense, such stakes, templates, platforms, equipment, tools and materials, and all labor as may be required in laying out any part of the work from the base lines and bench marks established by the Government. It shall be the responsibility of the Contractor to maintain and preserve all stakes and other marks established by the Contracting Officer until authorized to remove them, and if such marks are destroyed, by the Contractor or through his negligence prior to their authorized removal they may be replaced by the Contracting Officer, at his discretion, and the expense of replacement will be deducted from any amounts due or to become due the Contractor. The Contracting Officer may require that work be suspended at any time when location and limit marks established by the Contractor are not reasonably adequate to permit checking of the work.

8. QUANTITY SURVEYS (1968 APR.)

8.1 The Contractor shall make such surveys and computations as are necessary to determine the quantities of work performed or placed during each period for which a progress payment is to be made. The Contractor shall also make original and final surveys. The Government will make such computations as are necessary to determine the quantities of work performed or finally in place. Unless waived by the Contracting Officer in each specific case, quantity surveys made by the Contractor shall be made under the direction of a representative of the Contracting Officer.

8.2 All original field notes, computations and other records of the Contractor for the purposes of layout, original, progress and final surveys shall be recorded in duplicating field books, the original pages of which shall be furnished promptly in ring binders to the representative of the Contracting Officer at the site of the work and shall be used by the Contracting Officer to the extent necessary in determining the proper amounts of progress and final payments.

9. DAMAGE TO WORK. (1966 MAR OCE) The responsibility for damage to any part of the permanent work shall be as set forth in the clause of the contract entitled "Permits and Responsibilities." However, if, in the judgment of the Contracting Officer, any part of the permanent work performed by the Contractor is damaged by flood or earthquake, which damage is not due to the failure of the Contractor to take reasonable precautions or to exercise sound engineering and construction practices in the conduct of the work, the Contractor will make the repairs as ordered by the Contracting Officer and full compensation for such repairs will be made at the applicable contract unit or lump sum prices as fixed and established in the contract. If, in the opinion of the Contracting Officer, there are no contract unit or lump sum prices applicable to any part of such work an equitable adjustment pursuant to Clause 3, Changes, of the contract, will be made as full compensation for the repairs of that part of the permanent work for which there are no applicable contract unit or lump sum prices. Except as herein provided, damage to all work including temporary construction, utilities, materials, equipment and plant shall be repaired to the satisfaction of the Contracting Officer at the Contractor's expense, regardless of the cause of such damage.

10. PERFORMANCE OF WORK BY CONTRACTOR. (1965 JAN.). The Contractor shall perform on the site, and with his own organization, work equivalent to at least 35 percent of the total amount of work to be performed under the contract. If during the progress of the work hereunder the Contractor requests a reduction in such percentage, and the Contracting Officer determines that it would be to the Government's advantage, the percentage of the work required to be performed by the Contractor may be reduced; provided, written approval of such reduction is obtained by the Contractor from the Contracting Officer.

11. CONTRACTOR QUALITY CONTROL. The Contractor shall provide and maintain an effective quality control program that complies with General Provision 41 of the contract entitled "Contractor Inspection System."

11.1 The Contractor shall establish a quality control system to perform sufficient inspection and tests of all items of work, including that of his subcontractors, to ensure conformance to applicable specifications and drawings with respect to the materials, workmanship, construction, finish, functional performance, and identification. This control will be established for all construction except where the Technical Provisions of the contract provide for specific Government control by inspections, tests or other means. The Contractor's control system will specifically include the surveillance and tests required in the Technical Provisions of the contract specifications.

11.2 The Contractor's quality control system is the means by which he assures himself that his construction complies with the requirements of the contract plans and specifications. The controls shall be adequate to cover all construction operations and should be keyed to the proposed construction sequence.

11.3 The Contractor's job supervisory staff may be used for quality control, supplemented as necessary by additional personnel for surveillance, special technicians, or testing facilities to provide capability for the controls required by the Technical Provisions of the specifications. Prior approval is required for facilities, equipment, and personnel used by the Contractor in performing the specified tests

11.4 After the contract is awarded and before construction operations are started, the Contractor shall meet with the Contracting Officer, or his representative, and discuss quality control requirements. The meeting shall develop mutual understanding relative to details of the system, including the forms to be used for recording the quality control operations, inspections, administration of the system, and the interrelationship of Contractor and Government inspection.

11.5 The Contractor shall submit for approval within 14 days after the receipt of the Notice to Proceed a quality control plan which shall include the procedures, instructions, and reports to be used. This document will include as a minimum:

(1) The quality control organization.

(2) Number and qualifications of personnel to be used for this purpose.

(3) Authority and responsibilities of quality control personnel.

(4) Methods of quality control including that for his subcontractor's work.

(5) Test methods including, as specified, name of qualified testing laboratory to be used.

(6) Method of documenting quality control operation, inspection, and testing.

(7) A copy of a letter of direction to the Contractor's representative responsible for the quality control, outlining his duties and responsibilities, and signed by a responsible officer of the firm.

11.6 Unless specifically authorized in writing no construction shall be started until the Contractor's quality control plan is approved.

11.7 All compliance inspection will be recorded on an approved form, including but not limited to the specific items required in the Technical Section of the specifications. This form, to include records of corrective action taken, will be furnished to the Government as required by the Contracting Officer.

11.8 If recurring deficiencies in an item or items indicate that the quality control system is not adequate, such corrective actions will be taken as directed by the Contracting Officer.

11.9 In the event the Contractor fails to satisfactorily perform any required inspections and tests; to submit timely, complete, and factual reports and test data; or otherwise comply with the quality control provisions, the Contracting Officer may provide these services from another source and all costs for providing these services will be deducted from payments due the Contractor.

12. LOS ANGELES CITY LICENSE TAXES. Notwithstanding any other provisions of this contract:

(a) The contract price includes allocable Los Angeles City License Taxes, including those taxes (hereinafter referred to as "additional taxes") resulting from the application of principles expressed by the Los Angeles City Attorney in his opinion, dated 2 March 1960. If, after the contract date, the Contractor is not required to pay or bear the burden, or obtains a credit or refund of all or a portion of said taxes from the City of Los Angeles, the contract price shall be decreased by the amount of such relief or refund allocable to this contract, or that amount shall be paid to the Government, as the Contracting Officer directs. The contract price shall be similarly decreased if the Contractor, through his fault or negligence or failure to follow instructions of the Contracting Officer as provided in (b) below, is required to pay or bear the burden or does not obtain a refund of any such taxes. Interest paid or credited to the Contractor incident to a refund of these taxes shall inure to the benefit of the Government to the extent that such interest was earned after the Contractor was paid or reimbursed by the Government for these taxes.

(b) The Contractor shall comply with the instructions of the Contracting Officer in order to obtain a reduction, credit or refund of Los Angeles City License Taxes, and the contract price shall be equitably adjusted to cover the costs of such compliance, including reasonable attorneys fees arising therefrom.

(c) The Contractor shall maintain accurate records showing the amount of Los Angeles License Taxes, and specifically the amount of additional taxes, included in the contract price. (D/A Circular 715-2-59 dtd 3 Feb 1967).

13. PROGRESS SCHEDULE.

13.1 Reference is made to the General Provision entitled "Progress Charts and Requirements for Overtime Work."

13.2 The Progress schedule shall provide for a uniform rate of progress throughout the entire construction period. Actual progress shall be entered on the schedule weekly. The determination of whether or not the work is behind schedule will be based upon a uniform rate of production in each feature of the work. Falling more than 5 calendar days behind the approved progress schedule in any feature of the work shall constitute sufficient grounds for a determination that the Contractor has fallen behind the progress schedule. Failure of the Contracting Officer to act under this provision shall in no way relieve the Contractor of the responsibility for completion of the work on schedule.

14. VARIATIONS IN ESTIMATED QUANTITIES-SUBDIVIDED ITEMS. (1976 APR OCE) This clause is applicable only to the items listed herein.

14.1 In order to permit the Contractor to distribute his indirect costs properly to Items Nos. 4, 9, 33, 34 and 37 these items have been subdivided into 2 or more subitems. All the Contractor's indirect costs for each of these items will be included in the bid price for the first subitem listed under the respective item. Variation from the estimated quantity in the actual work performed under any second or subsequent subitem or elimination of all work under such a second or subsequent subitem will not be the basis for an adjustment in contract unit price.

14.2 Where the actual quantity of work performed for Items Nos. 4, 9, 33, 34 and 37 is less than 90 percent of the quantity of the first subitem listed under such item, the Contractor will be paid at the contract unit price for that subitem for the actual quantity of work performed and, in addition, an equitable adjustment in contract price shall be made upon demand of the Contractor. The equitable adjustment in price for the underrun shall be made on the basis that the Contractor has assumed the risk and is entitled to no adjustment for the first 10 percent underrun.

14.3 If the quantity of work performed under items Nos. 4, 9, 33, 34 and 37 exceeds 105 percent or is less than 96 percent of the total estimated quantity of the subitems under that item, and/or if the quantity of work performed under the second subitem or any subsequent subitem under items Nos. 4, 9, 33, 34 and 37 exceeds 105 percent or is less than 96 percent of the estimated quantity of any such subitem, and if such variation causes an increase or a decrease in the time required for performance of this contract the contract completion time will be adjusted as follows:

14.3.1 If the quantity variation is such that it will cause an increase in the time necessary for completion, the Contracting Officer shall, upon receipt of a written request for an extension within 10 days from the beginning of such delay or within such further period of time which the Contracting Officer grants prior to the late of final

settlement of the contract, ascertain the facts and make such adjustment for extending the completion date as in his judgment the findings justify.

14.3.2 If the quantity variation is such that it will cause a decrease in the time necessary for completion, the Contracting Officer shall ascertain the facts and promptly notify the Contractor in writing of his findings and the extent of adjustment.

14.4 If the parties fail to agree upon the adjustment to be made the dispute shall be determined as provided in Clause 6, "Disputes," of the General Provisions.

15. TIME EXTENSION. (1965 JAN.). Notwithstanding any other provisions of this contract it is mutually understood that the time extensions for changes in the work depend upon the extent, if any, by which the changes cause delay in the completion of the various elements of construction. The change order granting the time extension may provide that the contract completion date will be extended only for those specific elements so delayed and that the remaining contract completion dates for all other portions of the work will not be altered and may further provide for an equitable readjustment of liquidated damages pursuant to the new completion schedule.

16. FUNDS AVAILABLE FOR PAYMENTS. (1971 NOV OCE)

16.1 Such work as may be done under this contract in excess of the amount for which funds are available for payment as herein set forth, will be continued with funds hereafter appropriated and allotted for this work.

16.2 From funds heretofore appropriated by the Act of 1976, PL 94-355 90 Stat 891 for Construction, General the sum of $950,000.00 is available for payments to the Contractor for work performed under this contract.

16.3 If at any time it becomes apparent to the Contracting Officer that the balance of this allocation is in excess of the amount required to meet all payments due and to become due the Contractor because of work performed and to be performed pursuant to his approved progress schedule, the right is reserved after due notice to the Contractor to reduce said allocation by the amount of such excess.

16.4 If the rate of progress of the work is such that it becomes apparent to the Contracting Officer that the balance of this allocation and any allocation for this and any subsequent fiscal years during the period of this contract is less than that required to meet all payments due and to become due the Contractor because of work performed or to be performed under this contract, the Contracting Officer may provide additional funds for such payments if there be funds available for such purpose. The Contractor will be notified in writing of any additional funds so made available. However, it is distinctly understood and agreed that the amount of funds stated in 16.2 above is the maximum amount which it is certain will be available during the current fiscal year. The Government is in no case liable for payments to the Contractor beyond this amount or such additional amount as may subsequently be made available by the Contracting Officer pursuant to this paragraph 16.4.

16.5 It is expected that, during subsequent fiscal years over the period of this contract, Congress will make additional appropriations for expenditure on work under this contract. The Contracting Officer will notify the Contractor of any additional allocation of funds to this contract when such funds become available. It is understood and agreed that the Government is in no case liable for damages in connection with this contract on account of delay in payments to the Contractor due to lack of available funds. Should it become apparent to the Contracting Officer that the available funds will be exhausted before additional funds can be made available, the Contracting Officer will give at least 30 days written notice to the Contractor that the work may be suspended. If the Contractor so elects, after receipt of such notice, he may continue work under the conditions and restrictions under the specifications, so long as there are funds for inspection and superintendence, with the understanding; however, that no payment will be made for such work unless additional funds shall become available in sufficient amount. When funds again become available, the Contractor will be notified accordingly. Should work be thus suspended, additional time for completion will be allowed equal to the period during which work is necessarily so suspended, as determined by the dates specified in the above-mentioned notices.

16.6 So long as funds are available, payments will be made monthly in accordance with the clause of the contract entitled "Payments to Contractor." The unit prices or lump sum price or prices stated in the contract will be used in determining the amount to be paid for work performed by the Contractor.

16.7 The procedure above described will be repeated as often as may be necessary on account of the exhaustion of available funds and the necessity of awaiting the appropriation of additional funds by Congress.

16.8 Should Congress fail to provide additional funds the contract may be terminated and considered to be completed, at the option of the Contractor, without prejudice to him or liability to the Government, at any time subsequent to 30 days after payments are discontinued, or at any time subsequent to 30 days after the passage of the Act which would have but did not carry an appropriation for continuing the work or after the adjournment of the Congress which failed to make the necessary appropriations. However, if the funds cited in the contract are enough to extend the work beyond the end of the fiscal year and no new funds are allocated to this contract for the ensuing fiscal year, the Contractor must first exhaust all the cited funds and thereafter he may, at his option, exercise the right provided in this paragraph any time after payments are discontinued.

16.9 The progress schedule prepared in accordance with paragraph (a) of the contract clause entitled "PROGRESS CHARTS AND REQUIREMENTS FOR OVERTIME WORK" shall be consistent with the amount of funds stated in 16.2 above as being currently available for the period of time from the date of contract award to the end of the fiscal year in which the contract was awarded. Any portion of the progress schedule that applies to a fiscal year for which funds are not currently available will be prepared on the basis of a rate of progress that the Contractor considers to be practicable for completion of the work within the time provided by the contract. The progress schedule shall be revised each time the Contractor is notified that additional funds are made available and shall be consistent with the amount of additional funds so made available. The approval of a progress schedule is not a funding action and shall in no event be considered as making funds available or as obligating the Government to make funds available.

16.10 If the Contractor intends to perform any work at a rate of progress greater than that shown in his approved progress schedule, he shall submit to the Contracting Officer, for information only, an additional progress schedule that reflects his intended rate of progress. The Contracting Officer will take no action to approve or disapprove such an additional progress schedule. The receipt by the Contracting Officer of an additional progress schedule shall in no event be considered as making funds available or as obligating the Government to make funds available.

17. LISTED AGGREGATE SOURCES. (1965 APR OCE)

17.1 Concrete Aggregates meeting the requirements of these specifications can be produced from sources listed below.

17.1.1 Commercial Sources along the Salt River near Phoenix, Arizona.

17.1.2 Commercial Sources along the Aqua Fria River near Luke Air Force Base.

17.1.3 Commercial or new source along Cave Creek in vicinity of the project site.

17.2 Concrete Aggregates may be furnished from the above listed sources or at the option of the Contractor may be furnished from any other source designated by the Contractor and approved by the Contracting Officer, subject to the conditions hereinafter stated.

17.3 After the Award of the Contract, the Contractor shall designate in writing only one source or one combination of sources from which he proposes to furnish aggregates. If the Contractor proposes to furnish aggregates from a source or from sources not listed above, he may designate only a single source or single combination of sources for aggregates. Samples for acceptance testing shall be provided as required by Section: CONCRETE CONSTRUCTION of the "Technical Provisions." If a source for coarse and/or fine aggregate so designated by the Contractor is not approved for use by the Contracting Officer, the Contractor may not submit for approval other sources but shall furnish the coarse and/or fine aggregate, as the case may be, from a source listed above at no additional cost to the Government.

17.4 Listing of a source of concrete aggregate is not to be construed as approval of all material from that source. The right is reserved to reject materials from certain localized areas, zones, strata, or channels, when such materials are unsuitable for concrete aggregate as determined by the Contracting Officer. Materials produced from a listed source shall meet all the requirements of Section: CONCRETE CONSTRUCTION of the "Technical Provisions" of these specifications.

18. IDENTIFICATION OF GOVERNMENT-FURNISHED PROPERTY. (1968 SEPT.) The Government will furnish to the Contractor the following property to be incorporated or installed in the work or used in its performance. Such property will be furnished f.o.b. truck at the project site, and the Contractor will be required to accept delivery when made, and unloading and transporting the property to the jobsite at his own expense. All such property will be installed or incorporated into the work at the expense of the Contractor, unless otherwise indicated herein. The Contractor shall verify the quantity and condition of such Government furnished property when delivered to him, acknowledge receipt thereof in writing to the Contracting Officer.

Quantity	Items	Description
65	3" Bronze Disk	Monument Markers

* * * * *

PART II

TECHNICAL PROVISIONS

SECTION 1 A

GENERAL REQUIREMENTS

Index

1. Applicable Publications
2. Project Facilities
3. Construction Signs
4. Project Engineer's Office and Labratory
5. Bulletin Board
6. Maintenance and Disposal of Project Facilities
7. Scrap Material
8. Salvage Materials
9. Archaeological Findings During Construction
10. Public Utilities, Notices, and Restrictions
11. Public Safety
12. Personal Clothing Standards
13. Deleted
14. Occupational Safety and Health Act (OSHA) Standards
15. Quality Control
16. Permits
17. Dust Control

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 Federal Specifications.

FF-B-575C	Bolts, Hexagon and Square
FF-N-105B & Am-3	Nails, Brads, Staples and Spikes: Wire, Cut and Wrought
FF-N-836D & Am-1	Nut: Square, Hexagon, Cap, Slotted, Castle, Knurled, Welding, and Single Ball Seat
MM-L-751H	Lumber; Softwood
TT-E-529C & Am-1	Enamel, Alkyd, Semi-Gloss
TT-P-25E & Am-1	Primer Coating, Exterior (Undercoat for Wood, Ready-Mixed, White and Tints)

1.2 U.S. Department of Commerce National Bureau of Standards, Product Standard.

PS 1-74	Construction and Industrial Plywood

2. PROJECT FACILITIES. The Contractor shall construct and/or erect the following project facilities.

2.1 Construction Signs. The signs shall be erected as soon as possible and within 15 days after commencement of work under this contract.

2.1.1 Two Project Signs at locations designated by the Contracting Officer.

2.1.2 Warning Signs facing approaching traffic on all haul roads crossing under overhead power transmission lines.

2.1.3 Six hard hat signs at locations directed.

2.2 Project Engineer's Office and Laboratory, including a fenced parking area and a flagpole.

2.3 Bulletin Board at the Contractor's office.

2.4 Sanitary Facilities.

3. CONSTRUCTION SIGNS.

3.1 Materials.

3.1.1 Lumber shall conform to Federal Specification MM-L-751, and shall be seasoned Douglas Fir, S4S, Grade D or better except that posts, braces and spacers shall be construction Grade (WCLB).

3.1.2 Plywood shall conform to Product Standard PS 1, grade A-C, Group 1, exterior type.

3.1.3 Bolts, Nuts and Nails. Bolts shall conform to Federal Specification FF-B-575, nuts shall conform to Federal Specification FF-N-836, and nails shall conform to Federal Specification FF-N-105.

3.1.4 Paints and Oils. Paints shall conform to Federal Specifications TT-P-25 for primer and TT-E-529 for finish paint and lettering.

3.2 Construction.

3.2.1 Project and hard hat signs shall be constructed as detailed on Figures 1, 1A, 2, and 3. Decals and safety signs will be furnished by the Contracting Officer.

3.2.2 Warning Signs shall be constructed of plywood not less than 1/2 inch thick and shall be securely bolted to the supports with the bottom of the sign face 3 feet above the ground. The sign face shall be 2 x 4 feet, all letters shall be 4 inches in height, and the wording shall be: "WARNING: OVERHEAD TRANSMISSION LINES."

3.3 Painting. All exposed surfaces and edges of plywood shall be given one coat of linseed oil and be wiped prior to applying primer. All exposed surfaces of signs and supports shall be given one coat of primer and 2 finish coats of white paint. Except as otherwise indicated, lettering on all signs shall be black and sized as indicated.

4. PROJECT ENGINEER'S OFFICE AND LABORATORY.

4.1 General. The Contractor shall provide a suitable office trailer and a laboratory building for the Project Engineer. The exact site will require the Contracting Officer's approval. Both the trailer and the building shall be adequately heated, well lighted, suitably ventilated, and cooled with adequate refrigerated type air conditioning units, complete, with all piping and electrical connections. An adequate supply of cooled drinking water shall be furnished and maintained. Open parking space for 6 vehicles and water and sanitary facilities shall be located convenient to the office and laboratory. The combined parking and building area shall be enclosed with a woven wire fence approximately 6 feet high with a 10-foot wide lockable gate accessible from a road or street. The fenced area shall be of sufficient size to permit ease in the parking of vehicles. Materials for the facilities need not be new provided they are adequate for the intended use.

4.2 Officer Trailer shall be approximately 10 feet wide by 60 feet in length.

4.3 Laboratory Building shall be weathertight and shall have a 6-inch concrete slab floor and contain not less than 500 square feet of floor area. The laboratory shall be equipped with water supply, a sink approximately 20 x 35 x 8 inches, and the usual utilities.

4.4 Flagpole. The Contractor shall furnish and erect a flagpole at the Project Engineer's Office. The flagpole shall be either wood or sectional steel type, a product of a reputable manufacturer who has been regularly engaged in the manufacture of flagpoles. The flagpole shall be complete with standard fittings and equipment, including pulley, cleats, ground protector, halyards, and snap hooks. The pole shall have 20 feet exposed height and be set in concrete foundation in conformance with the manufacturer's recommendations. Painting of the wooden pole shall conform to the applicable requirements for the project sign. Steel pole shall be galvanized.

5. BULLETIN BOARD. A weatherproof bulletin board, approximately 36 inches wide and 30 inches high, with hinged glass door shall be provided adjacent to or mounted on the Contractor's project office. If adjacent to the office, the bulletin board shall be securely mounted on no less than 2 posts. Bulletin board and posts shall be painted or have other approved factory finish. The bulletin board shall be easily accessible at all times and shall contain wage rates, equal opportunity notice, and such other items required to be posted.

6. MAINTENANCE AND DISPOSAL OF PROJECT FACILITIES. The Contractor shall maintain the project facilities in good condition throughout the life of the project. Upon completion of work under this contract, the facilities covered under this section will remain the property of the Contractor and shall be removed from the site at his expense.

7. SCRAP MATERIAL. Materials indicated to be removed and not indicated to be salvaged, stored or reinstalled are designated as scrap and shall become the property of the Contractor and be removed from the site of the work. The Contractor by signing this contract hereby acknowledges that he made due allowance for value, if any, of such scrap in the contract price.

8. SALVAGE MATERIALS. All materials and/or equipment removed and indicated to be either stored or reinstalled are designated as salvaged materials and/or equipment. Any salvaged materials and equipment which are excess upon completion of the work and are not indicated to be stored shall become the property of the Contractor.

9. ARCHAEOLOGICAL FINDINGS DURING CONSTRUCTION. The removal of any Indian burial grounds or remains, ceremonial objects, petroglyphs, and archaeological and other artifacts of like nature found within the construction areas will be accomplished by the Government. In the event the Contractor's operations uncover, or his employees find any of the above described objects or materials within the construction areas, it shall be incumbent on the Contractor to notify immediately the Project Engineer or his authorized representative as to what has been found. The Project Engineer, when so notified of such findings, will determine the disposition in accordance with

prescribed regulations. Any remains from burials, including Indian ceremonial objects, or other remains of like nature found within the construction area, shall not be destroyed or removed. Should petroglyphs or archaeological material be discovered, the Contractor shall modify his operations so as not to disturb the findings pending receipt of notification from the Project Engineer of his determination of the final disposition of such findings. Any discoveries of an anthropological or archaeological nature upon the rights-of-way or upon Government property shall remain the property of the Government and not become the property of the person or persons making the discovery. Should the discovery site require archaeological studies resulting in delays and/or additional work, the Contractor will be compensated by an equitable adjustment under the General Provisions of the contract.

10. PUBLIC UTILITIES, NOTICES, AND RESTRICTIONS.

10.1 General. The approximate location of all railroads, pipe lines, power and communication lines, and other utilities known to exist within the limits of the work are indicated on the drawings. The sizes, locations, and names of owners of such utilities are given from available information, but their accuracy is not guaranteed. Except as otherwise indicated on the drawings, all existing utilities will be left in place and the Contractor shall conduct his operations in such a manner that the utilities will be protected from damage at all times, or arrangements shall be made by the Contractor for their relocation at the Contractor's own expense. The Contractor shall be responsible for any damage to utilities known to exist and shall reimburse the owners for such damage caused by his operations.

10.2 Relocation or Removal. Utilities to be relocated or removed not as part of this contract are designated "To be Relocated by Others" or "To be Removed by Others," respectively. Utilities shown on the plans and not so designated will be left in place and be subject to the provisions of the clause: PROTECTION OF EXISTING VEGETATION, STRUCTURES, UTILITIES, AND IMPROVEMENTS of the General Provisions. The Contractor may make arrangements with the owner for the temporary relocation and restoration of utilities not designated to be relocated, or for additional work in excess of the work needed to relocate utilities designated for relocation at no additional cost to the Government.

10.3 Utilities Not Shown. If the Contractor encounters, within the construction limits of the entire project, utilities not shown on the plans and not visible as of the date of this contract and if such utilities will interfere with construction operations, he shall immediately notify the Contracting Officer in writing to enable a determination by the Contracting Officer as to the necessity for removal or relocation. If such utilities are left in place, removed or relocated, as directed by the Contracting Officer, the Contractor shall be entitled to an equitable adjustment for any additional work or delay.

10.4 Coordination. The Contractor shall consult and cooperate with the owner of utilities that are to be relocated or removed by others to establish a mutual performance schedule and to enable coordination of such work with the construction work. These consultations shall be held as soon as possible after award of the contract or sufficiently in advance of anticipated interference with construction operations to provide required time for the removal or relocation of affected utilities.

10.5 Notices.

10.5.1 Traffic Routing. The Contractor shall notify the Contracting Officer 7 days in advance of the time work will be started in areas requiring the rerouting of traffic, traffic lane striping, and removal of street signs. The foregoing shall apply to progressive modifications of traffic routings within an area in which work is in progress. Additional requirements regarding traffic are included in section: DETOUR.

10.5.2 County Road Departments, Police, Highway Patrol, and Fire Departments shall be notified by the Contractor whenever a street is to be closed to traffic. If the closing is to be of long duration, a single notification to each department on the last working day before closing will be sufficient. A single notification shall then be made at the time the street is again opened to traffic. If the closing is to be of short duration or if different sections of the street are to be closed at different times, notifications shall be made on a day-to-day basis.

10.5.3 Utilities To be Relocated or Protected. The Contractor shall notify the Contracting Officer, in writing, 14 calendar days prior to starting work on any utility to be relocated or protected. On each relocation, notification shall include dates on which the Contractor plans excavation, by-pass work, removal work and/or installation work, as applicable.

10.5.4 Existing Bench Marks and R/W Markers. The Contractor shall notify the Contracting Officer, in writing, 7 days in advance of the time he proposes to remove any bench mark or right-of-way marker.

10.6 Restrictions.

10.6.1 Representatives of Other Agencies. Personnel representing owners and agencies may be present for various portions of the work. However, the Contractor will be responsible only to the Contracting Officer.

11. PUBLIC SAFETY. Attention is invited to the general provision: PERMITS AND RESPONSIBILITIES. The Contractor shall provide temporary fencing, barricades, and/or guards, as required, to provide protection in the interest of public safety. Whenever the Contractor's operations create a condition hazardous to the public, he shall furnish at his own expense and without cost to the Government, such flagmen and guards as are necessary to give adequate warning to the public of any dangerous conditions to be encountered and he shall furnish, erect, or maintain such fences, barricades, lights, signs and other devices as are necessary to prevent accidents and avoid damage or injury to the public. Flagmen and guards, while on duty and assigned to give warning and safety devices shall conform to applicable city, county, and state requirements. Should the Contractor appear to be neglectful or negligent in furnishing adequate warning and protection measures, the Contracting Officer may direct attention to the existence of a hazard and the necessary warning and protective measures shall be furnished and installed by the Contractor without additional cost to the Government. Should the Contracting Officer point out the inadequacy of warning and protective measures, such action of the Contracting Officer shall not relieve the Contractor from any responsibility for public safety or abrogate his obligation to furnish and pay for those devices. The installation of any general illumination shall not relieve the Contractor of his responsibility for furnishing and maintaining any protective facility.

12. PERSONAL CLOTHING STANDARDS.

12.1 Each employee shall be required to wear clothing suitable for the weather and job conditions of the work. At a minimum, the following personal clothing requirements shall be enforced:

12.1.1 Short sleeve shirts.

12.1.2 Long trousers.

12.1.3 Leather work shoes or other appropriate protective shoes or boots. Canvas shoes, tennis or deck shoes are not acceptable.

13. Deleted.

14. OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA) STANDARDS. The OCCUPATIONAL SAFETY and HEALTH ACT (OSHA) STANDARDS for CONSTRUCTION (Title 29, Code of Federal Regulations Part 1926 as revised from time to time) and the Corps of Engineers General Safety Requirements Manual, EM 385-1-1, are both applicable to this contract. The most stringent requirement of the two standards will be applicable.

14.1 EM 385-1-1, Change 1, 27 March 1972 is modified as follows: Cranes and derricks rated 10 tons capacity or larger except clam shells and similar shovel cranes shall be equipped with boom angle indicators. The boom angle indicator is to prevent loading beyond the manufacturers' rating at any boom angle radius and counter weight position.

15. QUALITY CONTROL. The Contractor shall inspect the work of his own forces and the work of all subcontractors for compliance with the contract requirements and record the results of the inspections. Legible copies of the daily inspection reports shall be maintained by the Contractor at the project site at all times and the original copies of the "Construction Quality Control Report" shall be delivered to the Contracting Officer on the work day following the date of the report.

15.1 Control of on-site construction. The Contractor's control shall include three phases of inspection for all definable features of work, as follows:

15.1.1 Preparatory inspection shall be performed prior to beginning any work on any definable feature of work. It shall include a review of contract requirements; a check to assure that all materials and/or equipment have been tested, submitted, and approved; a check to assure that provisions have been made to provide required control testing; examination of the work area to ascertain that all preliminary work has been completed; and a physical examination of material and equipment to assure that they conform to approved shop drawings or submittal data and that all material and/or equipment are on hand.

15.1.2 Initial inspection shall be performed as soon as work begins on a representative portion of the particular feature of work and shall include examination of the quality of workmanship as well as a review of control testing for compliance with contract requirements.

15.1.3 Follow-up inspections shall be performed daily to assure continuing compliance with contract requirements, including control testing, until completion of the particular feature of work.

15.2 The specified reports must be factual records of the Contractor's daily quality control activities and resulting actions. As such, they shall stress as major components of the report, the following:

(a) Phase(s) of construction underway during the time frame of the report. (i.e. earthwork, concrete work, structural steel erection, etc.)

(b) Phase (preparatory, initial, or follow-up), and locations of inspections and/or check tests that were made.

(c) Results of inspection, including nature of deficiencies observed and corrective actions taken or to be taken. If no inspections are listed on the report, it must be assumed that no inspections were made and that CQC is not being implemented.

(d) Report of tests performed by the Contractor, including those specified, with the results of the tests, including failures and remedial action to be taken. Test results of tests performed by the Contractor, including all computations should be attached to the report form. Where test results cannot be completed by the time the report is submitted, a notation should be made that the test was performed and the approximate date test results will be available. Delayed test results should be submitted with the report form on the date received.

(e) Monitoring of materials and equipment upon arrival at the jobsite and prior to incorporation into the work for compliance with submittal approvals, damage and proper storage.

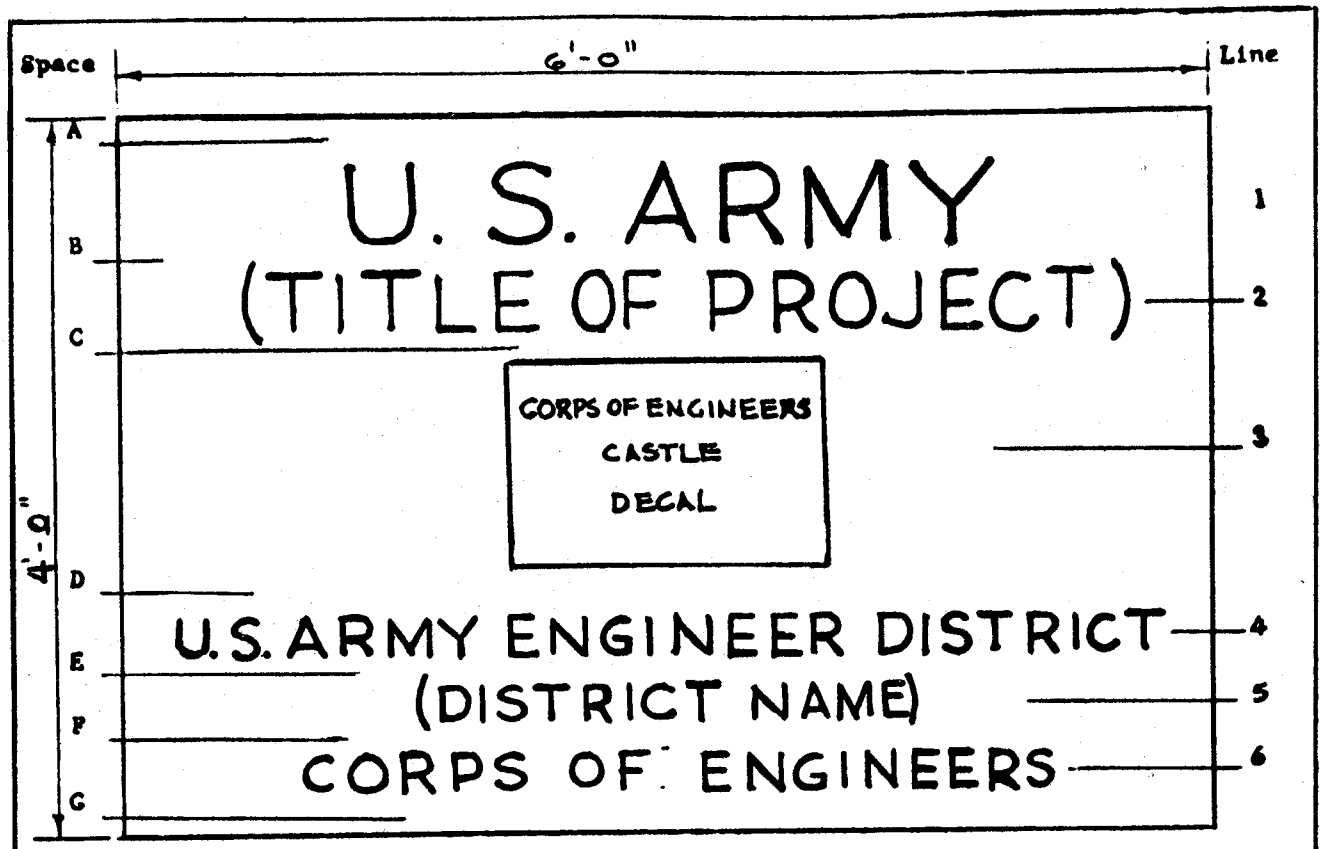
(f) Offsite surveillance activities.

(g) Job safety.

15.3 The report must contain a record of inspections and tests for all work accomplished subsequent to the previous report. Separate reports in different phases of the work may be submitted by the responsible CQC inspectors or they may be combined into one consolidated report if all CQC activities and results are covered and the responsible CQC inspectors are identified.

15.4 In all cases, the report or reports must be verified and signed by the one person delegated this responsibility by the Contractor. The verification should contain the statement that all supplies and materials incorporated in the work are in compliance with the terms of the contract except as noted.

* * * * *



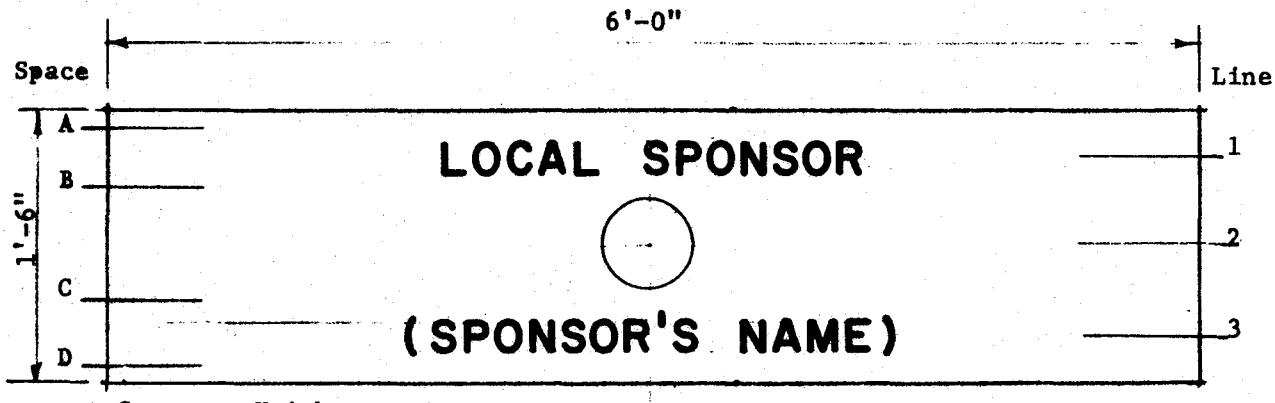
S C H E D U L E

Space	Height	Line	Description	Letter Height	Stroke
A	3"				
		1	U. S. ARMY	5 1/2"	7/8"
B	2"				
		2	PROJECT NOMENCLATURE	4"	5/8"
C	2"				
		3	CORPS OF ENGINEERS CASTLE (DECAL)	14"	--
D	3"				
		4	U. S. ARMY ENGINEER DISTRICT	2 3/4"	3/8"
E	2"				
		5	DISTRICT NAME	2 1/4"	1/4"
F	2"				
		6	CORPS OF ENGINEERS	2 1/2"	3/8"
G	3"				

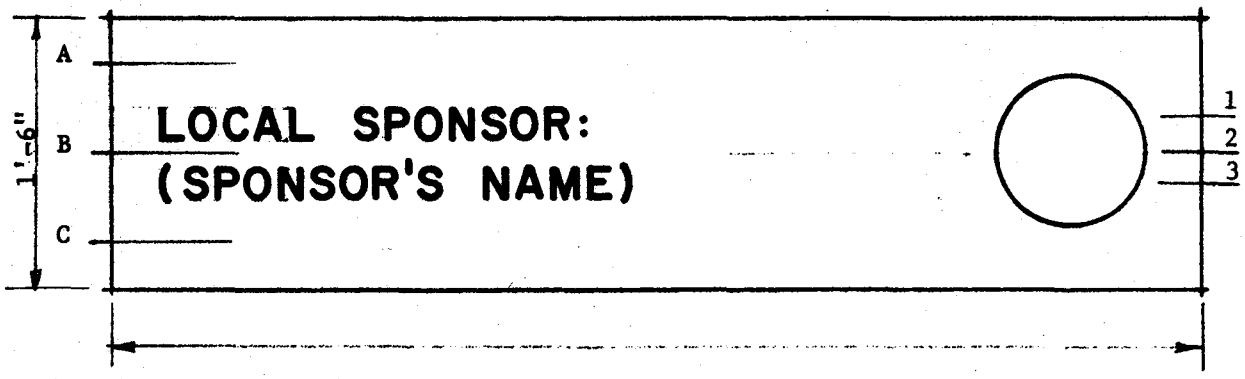
Lettering Color -- Black

PROJECT SIGN
(Army-Civil Works)

Figure 1
14 August 1972



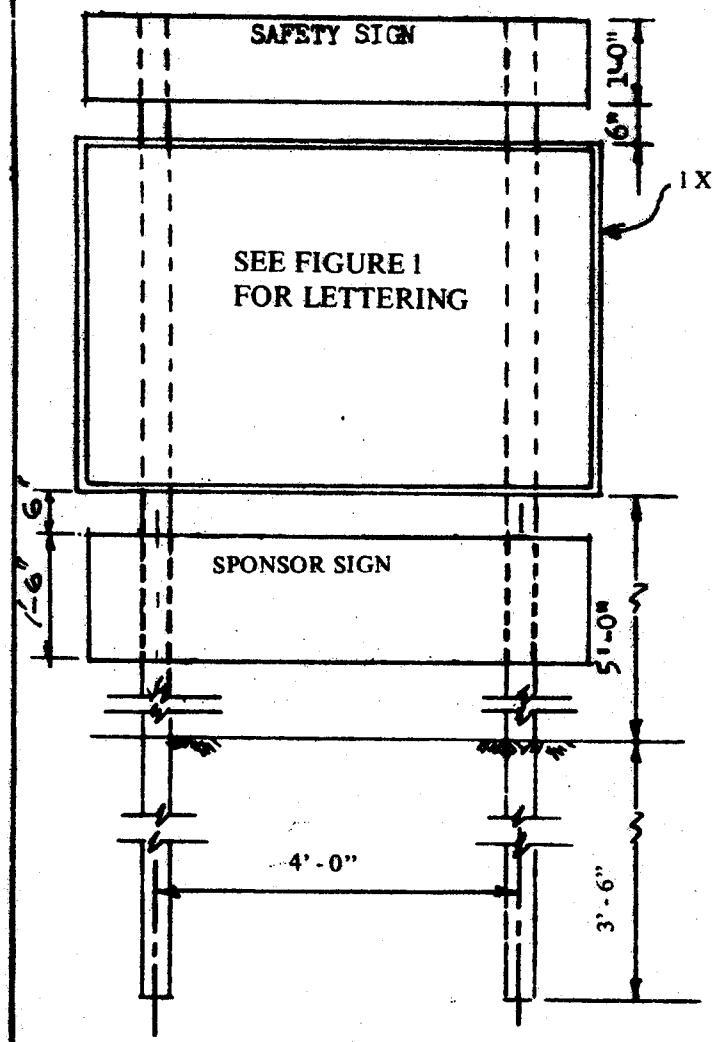
Space	Height	Line	Description	Letter Height	Stroke
A	2"				
		1	LOCAL SPONSOR	2"	3/8"
B	2" Min.				
		2	SPONSOR'S EMBLEM (DECAL)		
C	2" Min.				
		3	SPONSOR'S NAME	2"	3/8"
D	2"				



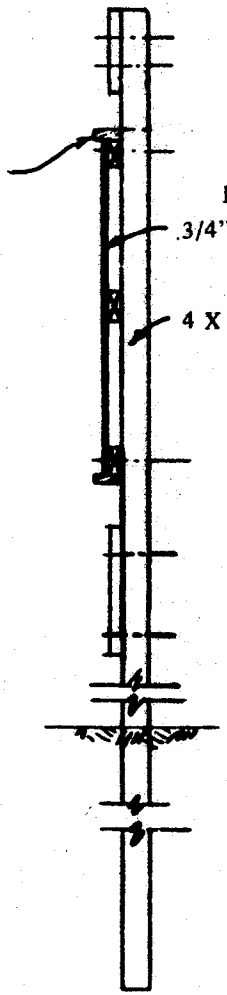
Space	Height	Line	Description	Letter Height	Stroke
A	6"				
		1	LOCAL SPONSOR	2"	3/8"
B	2"				
		2	SPONSOR'S EMBLEM (DECAL)		
C	6"				
		3	SPONSOR'S NAME	2"	3/8"

Lettering Color -- Black

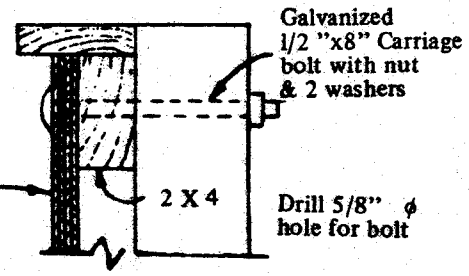
Figure 1A
21 February 1975



ELEVATION



SECTION



DETAIL

General Notes

1 - Lumber to be cut & formed accurately.

2 - Secure 1 X 4 and plywood with 6d finish nails at not less than 12" O.C.

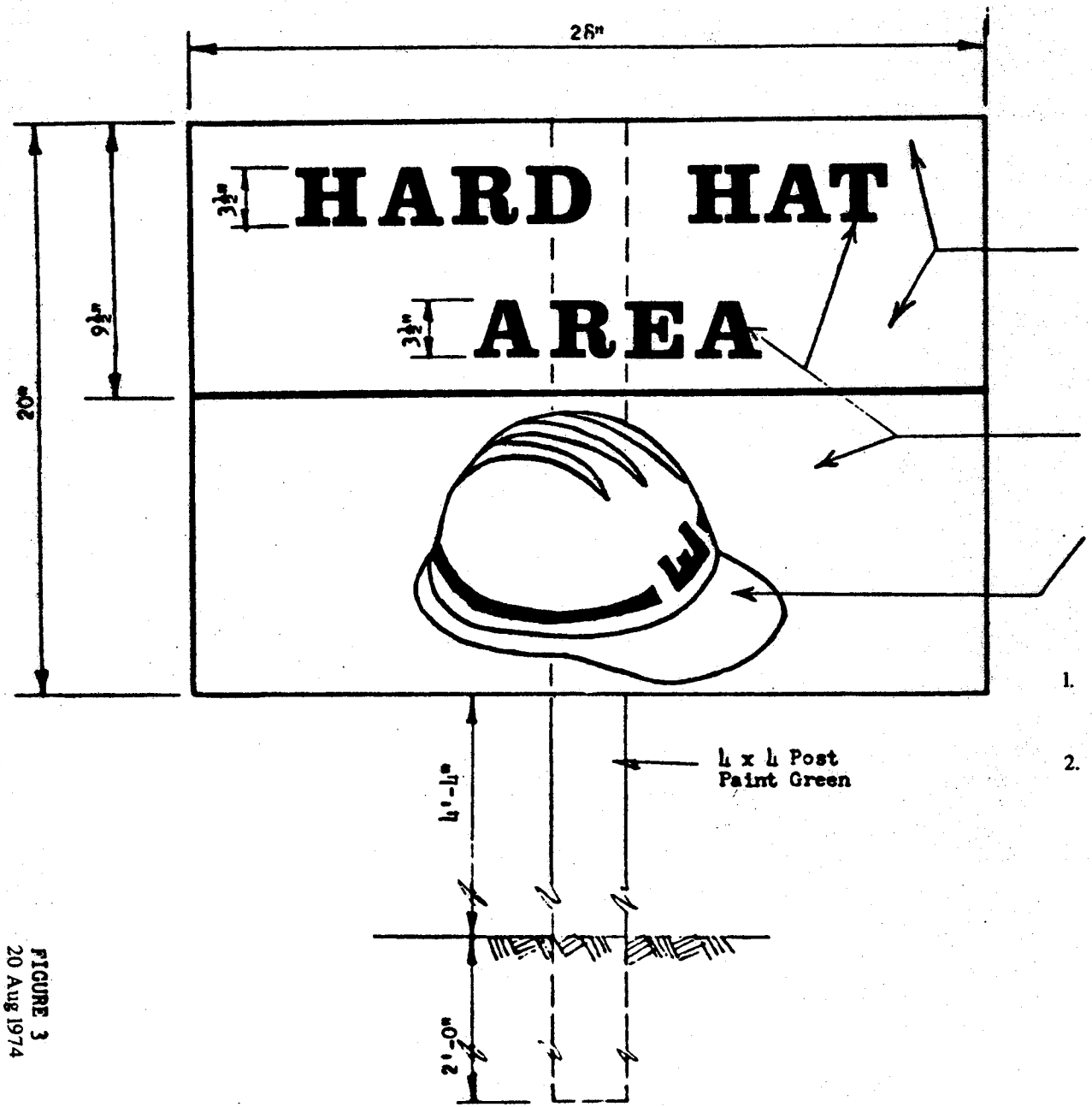
3 - All exposed nails to be set & holes filled with putty.

4 - Sign to be set in good solid ground & backfill carefully tamped into place.

5 - Where necessary, posts shall be braced to provide a solid installation.

SIGN DETAILS

Figure 2
25 February 1975



General Notes

1. Green & White Paint shall be opaque glossy as specified in ANSI Standard Z53.1
2. Bolt Sign to Post w/2½" dia. Carriage Bolts.

FIGURE 3
20 Aug 1974

SECTION 1B

MEASUREMENT AND PAYMENT

Index

1. Diversion and Control of Water
2. Clearing and Grubbing
3. Stripping
4. Excavation
5. Fills
6. Embankment
7. Additional Rolling
8. Filter Material
9. Stone
10. Grouting Stonework
11. Concrete
12. Outlet Works
13. Grout, Slurry
14. Portland Cement
15. Steel, Reinforcement
16. Foundation Drilling and Grouting
17. Double Drive Gates
18. Corrugated Metal Pipe
19. Metal and Sections
20. Reinforce Concrete Pipe
21. Pipe Culvert Inlet and Outlet Structures
22. Aggregate Base and Surfacing
23. Asphalt Concrete Pavement
24. Traffic Control Devices
25. Guard Rail
26. Instrumentation
27. Overlook Structure and View Point Slab
28. Water Surface Recording Facility
29. Overlook Restroom
30. Seeding
31. Project Sign
32. Planting
33. Landscape Fill and Topsoil

1. DIVERSION AND CONTROL OF WATER. Pavement for Diversion and Control of Water will be made at the applicable contract price, which payment shall constitute full compensation for constructing the diversion dikes and for maintaining the working areas in a dry condition during construction.

2. CLEARING AND GRUBBING. Payment for clearing and grubbing will be made at the applicable contract price, which payment shall constitute full compensation for all clearing and grubbing, complete.

3. STRIPPING.

3.1 Measurement for stripping will be based on surveys taken immediately before and after the stripping operations. Quantities will be computed in cubic yards by the average end area method and the planimeter will be considered a precise instrument for measuring plotted cross sections. Material used in stone protection and borrow area stripped material will not be included in the measurement.

3.2 Payment for stripping will be made at the applicable contract price, which shall constitute full compensation for stripping the dam borrow areas and dike areas and disposing of excavated materials.

4. EXCAVATION.

4.1 Measurement.

4.1.1 A survey of the site will be made prior to commencement of work, and all measurements will be based on this survey without regard to any changes in the site that may occur during the prosecution of the work.

4.1.1.1 Measurement for scaling, abutment, dental, toe, foundation and cutoff trench, drainage and bypass channels, and foundation excavation will be based on the survey made prior to commencement of the excavation work and surveys taken after the excavation. All excavations outside of excavation lines indicated on the drawings which was not authorized by the Contracting Officer will be considered as being for the convenience of the Contractor and such excavation will not be measured for payment.

4.1.1.2 Measurement for outlet works, spillway and access and overlook roads excavations will be made between the excavation lines and grades, indicated on the drawings and specified, and the ground surfaces as indicated by the survey made prior to commencement of the excavation work. The quantity of directed excavation necessary for the removal of unsuitable foundation material as specified will be included in the measurement of the escavation where the unsuitable soils are encountered.

4.1.2 Quantities will be computed in cubic yards by the average end area method and the planimeter will be considered a precise instrument for measuring plotted cross sections.

4.1.3 Trenches. No separate payment will be made for excavation of pipe trenches. All costs in connection therewith shall be included in the contract price for the item to which the work applies.

4.1.4 Excavation for Structures. No separate payment will be made for excavation for structures. All costs therefor shall be included in the applicable contract prices for the items to which the work applies.

4.2 Payment for Excavation will be made at the applicable contract prices, which payments shall constitute full compensation for escavating, hauling and disposing of the excavated materials. Excavation for access and overlook roads shall also include all costs for grading and subgrade preparation. 5. FILLS.

5.1 Measurement for fills will be made between the excavation and structure lines and the fill limit lines, or between the ground lines and fill lines, as indicated on the drawings, Quantities will be computed in cubic yards by the average end area method and the planimeter will be considered a precise instrument for measuring plotted cross sections.

5.2 Payment for the various types of fills will be made at the applicable contract prices which payments shall constitute full compensation for obtaining, hauling, stockpiling, spreading and compacting the material including preparation of the subgrades, protection of slopes and preparation of ground for fills.

5.2.1 Trenches. No separate payment will be made for backfilling trenches for pipelines. All costs in connection therewith shall be included in the contract price for the item to which the work applies.

6. EMBANKMENT.

6.1 Measurement. Embankment will be measured between the foundation lines, as determined on the basis of surveys made after stripping, scaling, trench, abutment, and foundation excavation and the completion of foundation preparation and the payment lines grades, and slopes, indicated on the drawings, or otherwise directed by the Contracting Officer. Quantities will be computed in cubic yards by the average end area method and the planimeter will be considered a precise instrument for measuring plotted cross sections.

6.2 Payment for the various types of embankments will be made at the applicable contract prices which payments shall constitute full compensation for obtaining, placing and compacting the embankments, complete in place. Payment for embankment will include all costs for foundation preparation except grout slurry and dental concrete.

7. ADDITIONAL ROLLING.

7.1 Measurement. Embankment compaction required in addition to the number of passes specified will be measured on the basis of the number of hours of rolling equipment approved for this job is operated in making additional required passes. In computing the number of hours worked by the rolling equipment only the time of actual operation will be included. Time lost by rolling equipment on account of refueling, greasing, oiling, breakdowns or replacement of parts will not be measured.

7.2 Payment for Additional Rolling will be made at the applicable contract price, which payment shall constitute full compensation for work necessary to complete the additional rolling.

8. FILTER MATERIAL.

8.1 Measurement. The quantity of filter material to be paid for will be the number of cubic yards of filter material acceptably placed within the lines and grades indicated or directed.

8.2 Payment for Filter Material will be made at the applicable contract price which payment shall constitute full compensation for obtaining and placing the filter material, complete in place.

9. STONE.

9.1 Measurement. The quantity of Type I stone and riprap to be paid for will be the number of tons, determined by scale weights acceptably placed within the lines and grades indicated on the drawingor directed by the Contracting Officer.

9.2 Payment for the various types of stone will be made at the applicable contract prices, which payments shall constitute full compensation for the stone, complete in place, except grouting of stone work for which separate payment is provided.

10. GROUTING STONEWORK.

10.1 Measurement. The quantity of grout to be paid for will be measured to the nearest cubic yard by weighing all ingredients in trial batches of grout and converting each batch to absolute volume; the volume thus determined and the number of batches of grout of corresponding proportions acceptably placed in the work shall be used to determine the quantity of grout.

10.2 Payment for Grouting Stonework will be made at the applicable contract price which payment shall constitute full compensation for all costs for grouting stonework (except for Portland cement), including placing and curing.

11. CONCRETE.

11.1 Measurement of concrete for the spillway sill will be made on the basis of the actual volume of concrete within the paylines of the structures; within the "B" line and the finished concrete surface; within the "B" line, excavation line and the finished concrete surface; and within the excavation line and the finished concrete surface, as applicable and as indicated on the drawings. Concrete placed beyond the "B" line will not be measured for payment. Except as indicated on the drawings, the measurement of concrete placed against the sides of any excavation without the use of intervening forms will be made only within the paylines of the structure. No deductions will be made for rounded or beveled edges or space occupied by metal work, electrical conduits or timber, nor for voids' or embedded items which are either less than 5 cubic feet in volume or one square foot in cross section.

11.1.1 Measurement for Dental Concrete will be based on the number of cubic yards acceptably placed in the areas indicated or directed. Measurement of concrete will be made to the nearest cubic yard by weighing all ingredients in trial batches of concrete and converting each batch to absolute volume. The volume thus determined and the number of batches of concrete of corresponding proportions acceptably placed in the work (unless specifically excepted, wasted, or used for convenience of the Contractor) shall determine the quantity of concrete.

11.2 Payment for concrete will be made at the applicable contract prices, which payments shall constitute full compensation for labor, materials (except cement and reinforcement for which other payment is provided), and for all equipment and tools required to complete the concrete work. Embedded items including waterstops shall be included in cost of the concrete except when other payment is specifically provided. No payment will be made for concrete, as such, which is placed in structures for which payment is made on a lump sum basis.

12. OUTLET WORKS.

12.1 Payment for Outlet Works will be made at the applicable contract price which payment shall constitute full compensation for the outlet works complete including intake structure, conduit, retaining wall, energy dissipator, concrete, cement and reinforcement, and earthwork outside the limits of other required earthwork. Payment also includes precast bridge grating assembly, handrail and energy dissipator fencing.

13. GROUT, SLURRY.

13.1 Measurement. The quantity of slurry grouting to be paid for will be based on the number of cubic feet acceptably placed in the areas specified by the Contracting Officer.

13.2 Payment for Grout, Slurry will be made at the applicable contract price, which payment shall constitute full compensation for the grout, complete in place including cement.

14. PORTLAND CEMENT.

14.1 Measurement. The quantity to be paid for will be the number of hundredweight (100 pounds) of Portland cement used in the concrete for structures paid for on a unit price basis and grouting stonework unless specifically excepted, wasted or used for the convenience of the Contractor. The quantity to be paid for will be determined by multiplying the theoretical batch weight of Portland cement by the number of batches of concrete placed within the paylines of the structures and dividing by 100. The quantity of cement used in grouting stonework will be the actual weight of cement used in batches divided by 100.

14.2 Payment for Portland Cement will be made at the applicable contract price, which payment shall constitute full compensation for furnishing the Portland cement complete, ready for use in the work. No payment will be made for Portland cement as such, which is used in concrete in structures for which payment is made on a lump sum basis.

15. STEEL, REINFORCEMENT.

15.1 Measurement of reinforcement in structures paid on a cubic yard basis will be made of the lengths of bars actually placed in the completed work in accordance with the drawings, approved bar schedules or as directed. The measured lengths will be converted to weights for the bar numbers listed by the use of the unit weights per linear foot contained in ASTM Specification A615. Steel in laps indicated on the drawings or required by the Contracting Officer will be measured. No measurement will be made for the additional steel in laps which are authorized for the convenience of the Contractor. No measurement will be made of steel supports and spacers. All costs for furnishing and installing supports and spacers shall be included in the various items with the reinforcement.

15.2 Payment for Steel Reinforcement will be made at the applicable contract price which payment shall constitute full compensation for the steel reinforcement complete in place.

16. FOUNDATION DRILLING AND GROUTING.

16.1 Measurement.

16.1.1 Pipe for Grout Holes will be measured for payment based on the linear feet actually furnished, installed, left in place and in a usable condition as shown on the drawings as directed.

16.1.2 Drill Set-Ups to be paid for will be the actual number of set-ups made for acceptably drilled holes or portions of holes as directed.

16.1.3 Drilling of Exploratory and Grout Holes will be measured for payment on the basis of the linear feet of acceptable holes actually drilled, as shown on the drawings or directed, beginning at the surface of the rock. The linear feet of drilling for each grout hole will be measured separately.

16.1.4 Washing and Pressure Testing. The quantity to be paid for will be the actual number of hours and fractions thereof, measured to the nearest 15 minutes, devoted to washing and pressure testing of grout holes as directed. The beginning of the period for payment shall be the time at which the water hose is connected to the hole for washing and pressure testing, and the end of the period shall be the time at which the water hose is disconnected from the hole, except that excessive time expended in connecting or disconnecting the water hose or in pressure testing because of defective equipment or any other reason not the fault of the Government will not be included in the time approved for payment. All other work in connection with washing and pressure testing shall be considered incidental to and included in the unit price paid therefor.

16.1.5 Grout Pump Connections will be measured for payment on the actual number of times the grout pump supply line is acceptably connected to inject grout into a grout hole as directed regardless of the number of times such connections are made for each hole or the amount of grout actually injected.

16.1.6 Placing Grout will be measured for payment on the basis of the number of sacks (94 pounds) of materials, exclusive of water and regardless of the proportions of the gtout mixes, satisfactorily placed in the dam foundation and surface treatment.

16.2 Payment.

16.2.1 Payment for mobilization and demobilization will be made at the applicable contract price, which payment shall include all cost for the moving of all equipment, materials and personnel setting up at the first drilling and grouting site, sanitary facilities and the removal of equipment, unused materials and miscellaneous debris from the site after completion of drilling and grouting work.

16.2.2 Payment for pipe for grout holes will be made at the applicable contract price, which payment shall constitute full compensation for all pipe and fittings for grout holes and installing such pipe, complete except drilling the hole incidental to setting the pipe which shall be paid for separately.

16.2.3 Payment for drill set-ups will be made at the applicable contract price, which payment shall constitute full compensation for moving all equipment necessary for grout drilling operations from a previously drilled hole to the site of the next hole ready for drilling, complete.

16.2.4 Payment for drilling grout and exploratory holes will be made at the applicable contract prices, which payments shall constitute full compensation for drilling grout and exploratory holes, except all costs incidental to drill set-ups which will be paid for separately. The redrilling of grout, that has been allowed to set in a partially completed hole by direction of the Contracting Officer, will be paid for at the rate of 50 percent of the applicable contract price.

16.2.5 Payment for washing and pressure testing will be made at the applicable contract price, which payment shall constitute full compensation for completing the work under this item.

16.2.6 Payment for grout pump connection will be made at the applicable contract price which payment shall constitute full compensation for all labor and incidentals for each connection. Where packer grouting is used, payment for connection will be made for each packer setting in a hole.

16.2.7 Payment for placing grout will be made at the applicable contract price, which payment shall constitute full compensation for furnishing cement, proportioning, mixing and injecting the grout, as specified herein, or as directed, including hand pouring and sealing of surface leaks, and open cracks in the foundation, except for making grout pump connections to grout holes which will be paid for separately. No payment will be made for grout lost due to improper anchorage of grout pipe or connections, for grout lost due to negligence of the Contractor, for grout rejected because of improper mixing.

17. DOUBLE DRIVE GATES. Payment for Double Drive Gates will be made at the applicable contract price per each, which payment shall constitute full compensation for the gates, complete in place.

18. CORRUGATED METAL PIPE.

18.1 Measurement. The quantity of corrugated metal pipe to be paid for will be measured along the centerline of the various sizes and types of pipe furnished and installed in place, measured from end-to-end of the pipe in place.

18.2 Payment for corrugated metal pipe of the various sizes will be made at the applicable contract prices, which payments shall constitute full compensation for furnishing and installing the corrugated metal pipe, complete in place, including applicable earthwork, but not including metal end sections.

19. METAL END SECTIONS. Payment for metal end sections of the various sizes will be made at the applicable contract price per each, which payment shall constitute full compensation for the metal end sections, complete in place, including excavation and backfill.

20. REINFORCED CONCRETE PIPE, 108-INCH.

20.1 Measurement. The quantity of reinforced concrete pipe to be paid for will be measured along the centerline of pipe furnished and installed in place, measured from end-to-end of the pipe in place.

20.2 Payment for reinforced concrete pipe will be made at the applicable contract price, which payment shall constitute full compensation for furnishing and installing the reinforced concrete pipe, complete in place, including applicable earthwork, but not including inlet and outlet structures.

21. PIPE CULVERT INLET AND OUTLET STRUCTURES. Payment for pipe culvert inlet and outlet structures will be made at the applicable contract price, per each, which payment shall constitute full compensation for the inlet and outlet structures, complete in place, including excavation, backfill, and concrete including cement.

22. AGGREGATE BASE AND SURFACING.

22.1 Measurement of aggregate base and surfacing completed and accepted by the Contracting Officer will be in cubic yards. The volume of aggregate base and surfacing in place and accepted by the Contracting Officer will be determined by the average job thickness obtained in accordance with paragraph: THICKNESS CONTROL of the section: AGGREGATE BASE COURSE and the dimensions indicated.

22.2 Payment for stabilized aggregate base and surfacing will be made at the applicable contract price, which shall constitute full compensation for the construction and completion of the stabilized-aggregate base and surfacing and for the furnishing of all other labor and incidentals necessary to complete the work.

23. ASPHALT CONCRETE PAVEMENT.

23.1 Measurement. The unit of measurement for the asphalt concrete will be the ton (2,000 pounds). The Contractor shall weigh each load on a certified platform scale and shall furnish the Contracting Officer with duplicate Weighmasters' Certificates showing the actual net weights. One ticket shall be furnished to the plant inspector and one ticket to the inspector at the construction site. The bituminous mixture shall be weighed after mixing and no deduction will be made for the weight of bituminous material incorporated therein.

22.2 Payment for asphalt concrete pavement will be made at the applicable contract price which shall constitute full compensation for furnishing, spreading, and compacting the asphalt concrete surfacing complete in place, including bituminous material, preparation for placing, prime coat, preparation for placing, and all incidentals.

24. TRAFFIC CONTROL DEVICES. Payment for Traffic Control Devices will be made at the applicable contract price, which shall constitute full compensation for permanent traffic regulatory signs, guide posts, and concrete wheel bumper complete in place.

25. GUARD RAIL.

25.1 Measurement. The quantity of guard rail to be paid for will be the number of linear feet of guard rail measured from end to end of rail, acceptably installed in the work.

25.2 Payment for guard rail will be made at the applicable contract price, which payment shall constitute full compensation for the guard rail, complete in place, including earthwork.

26. INSTRUMENTATION. Payment for Instrumentation will be made at the applicable contract price which payment shall constitute full compensation for staff gages, settlement monuments and settlement plates complete in place.

27. OVERLOOK STRUCTURE AND VIEW POINT SLAB. Payment for Overlook Structure and View Point will be made at the applicable contract price, which payment shall constitute full compensation for the overlook structure and view point structures, complete in place, including concrete, steel, reinforcement and earthwork. Payment will include the foot trails.

28. WATER SURFACE RECORDING FACILITY. Payment for Water Surface Recording Facility will be made at the applicable contract price which payment shall constitute full compensation for the water surface recording facility complete, in place, including excavation and backfill and concrete.

29. OVERLOOK RESTROOM. Payment for Overlook Restroom will be made at the applicable contract price which payment shall constitute full compensation for the restroom complete in place including excavation, backfill and sanitary disposal facilities.

30. SEEDING.

30.1 Measurement. The unit of measurement for seeding shall be the acre. The quantity of seeding to be paid for will be the acreage actually seeded as specified, computed to the nearest 1/10 of an acre.

30.2 Payment for seeding will be made at the applicable contract price which payment, shall constitute full compensation for seeding, complete, including maintenance.

31. PROJECT SIGN. Payment for project sign will be made at the applicable contract price, which payment shall constitute full compensation for the project sign complete.

32. PLANTING. Payment for planting will be made at the applicable contract price which payment shall constitute full compensation for the planting of plants and trees complete, including maintenance.

33. LANDSCAPE FILL AND TOPSOILING. Payment for landscape fill and topsoiling will be made at the applicable contract price, which payment shall constitute full compensation for landscape fill and topsoiling complete, in place.

* * * * *

SECTION 1D

ENVIRONMENT PROTECTION

Index

1. Scope
2. Reference
3. General
4. Notification
5. Subcontractors
6. Implementation
7. Protection of Land Resources
8. Recording and Preserving Historical and Archaeological Finds
9. Protection of Water Resources
10. Maintenance of Viewpoint Facilities
11. Protection of Fish and Wildlife
12. Disposal of Cleared and Grubbed Material and Other Debris
13. Dust Control
14. Maintenance of Pollution Control Facilities During Construction

1. SCOPE. This section covers the furnishing of all labor, materials and equipment and performing all work required for the protection of the environment during and as a result of construction operations except for those measures set forth in other Technical Provisions of these specifications.

2. REFERENCE. "Standard Methods for the Examination of Water, Sewage, and Industrial Wastes", Thirteenth Edition, 1971, published by American Public Health Association, 1015 Eighteenth Street, N.W., Washington, D.C. 20036.

3. GENERAL. For the purpose of this specification, environment protection is defined as the retention of the environment in its natural state to the greatest possible extent during project construction and to enhance the natural appearance in its final condition. Environment protection requires consideration of air, water, and land, and involves noise, solid waste-management and management of radiant energy and radioactive materials, as well as other pollutants. In order to prevent, and to provide for abatement and control of, any environmental pollution arising from the construction activities in the performance of this contract, the Contractor and his subcontractors shall comply with all applicable Federal, State, and local laws and regulations concerning environmental pollution control and abatement, and all applicable provisions of the Corps of Engineers Manual EM 385-1-1, entitled "General Safety Requirements".

4. NOTIFICATION. The Contracting Officer will notify the Contractor in writing of any non-compliance with the aforementioned Federal, State or local laws or regulations. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. The Contractor shall, after receipt of such notice, immediately inform the Contracting Officer of proposed corrective action and take such action as may be approved. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extention of time or for excess costs or damages by the Contractor.

5. SUBCONTRACTORS. Compliance with the provisions of this section by subcontractors will be the responsibility of the Contractor.

6. IMPLEMENTATION. Prior to commencement of the work the Contractor will:

(1) submit in writing his proposals for implementing this section for environment protection;

(2) meet with representatives of the Contracting Officer to develop mutual understandings relative to compliance with this provision and administration of the environment protection program.

Approval of the Contractor's plan for environment protection will not relieve the Contractor of his responsibility for adequate and continuing control of pollutants.

7. PROTECTION OF LAND RESOURCES.

7.1 General. The land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction that will appear to be natural and not detract from the appearance of the project. The Contractor shall confine his construction activities to areas defined by the plans or specifications. The following additional requirements are intended to supplement the requirements of General Provisions 49, 50 and 53.

7.2 Prevention of Landscape Defacement. Except in areas indicated on the plans or specified to be cleared, the Contractor shall not deface, injure, or destroy trees, cacti or shrubs, nor remove or cut them without the authority of the Contracting Officer. Ropes, cables, or guys shall not be fastened to or attached to any existing nearby trees for anchorages unless specifically authorized. Where such special emergency use is permitted, it shall be performed in such a manner as to avoid damage to the trees. The Contractor shall in any event be responsible for any damage resulting from such use. Where the possibility exists that trees may be defaced, bruised, injured, or otherwise

damaged by the Contractor's equipment or operations, the Contractor shall adequately protect such trees. Stone, earth or other material that is displaced into uncleared areas shall be removed. Monuments and markers shall be protected before construction operations commence. A preconstruction survey including photographs shall be accomplished by the Contractor and a report of survey furnished when required by the Contracting Officer.

7.3 Restoration of Landscape Damage. Any trees, cacti, shrubs, or other landscape features scarred or damaged by the Contractor's equipment or operations shall be restored to a condition satisfactory to the Contracting Officer. Restoration of scarred and damaged trees, cacti, shrubs, and other features shall be performed in an approved manner by experienced workment. Items damaged beyond restoration shall be removed and disposed of under requirements for clearning and grubbing. Trees, cacti and other shrubs that are to be removed because of damage shall be replaced at the Contractor's expense by matured replacements of the same species or a species approved by the Contracting Officer. The size and quality of all replacement shall also be approved by the Contracting Officer.

7.4 Location of Camp Sites, Storage and Housing Facilities. Contractor's camps, storage, and other construction buildings, located on Government property, which is required in the performance of the work, shall be located upon cleared portions of the job site or areas to be cleared, and shall require written approval of the Contracting Officer. The preservation of the landscape shall be an imperative consideration in the selection of all sites and in the construction of buildings. Plans showing camp sites, storage and housing facilities shall be submitted for approval of the Contracting Officer. Where buildings or tent platforms are constructed on sidehills, the Contracting Officer may require cribbing to be used to obtain level foundations. Benching or leveling of earth may be permitted, depending on the location of the proposed facility.

7.5 Temporary Excavation and Embankments. If the Contractor proposes to construct temporary roads or embankments and excavations for plant and/or work areas, he shall submit the following for approval prior to scheduled start of such temporary work.

7.5.1 A layout of all temporary roads, excavations and embankments to be constructed within the work area. Temporary roads shall not exceed 40 feet in width and shall follow the alinement of existing dirt roads where practical.

7.5.2 A landscaping plan showing the proposed restoration of the area. The plan shall provide for the obliteration of construction scars as such and shall provide for a reasonably natural appearing final condition of the area. No unauthorized road construction, excavation or embankment construction (including borrow and disposal areas) will be permitted.

7.6 Post-Construction Cleanup or Obliteration. The Contractor shall obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, or stockpiles of excess or waste materials, as directed by the Contracting Officer. The area will be restored to near natural conditions which will permit the growth of vegetation thereon. Except in specific cases, restoration to original contours will not be required, however all restored areas shall be smoothly and evenly dressed and sloped to drain.

8. RECORDING AND PRESERVING HISTORICAL AND ARCHAEOLOGICAL FINDS. All items having any apparent historical or archaeological interest which are discovered in the course of any construction activities shall be carefully preserved. The Contractor shall leave the archaeological find undisturbed and shall immediately report the find to the Contracting Officer so that the proper authorities may be notified.

9. PROTECTION FO WATER RESOURCES.

9.1 General. The Contractor shall not pollute streams, lakes, water courses or reservoirs with fuels, oils, bitumens, calcium chloride, acids, insecticides, herbicides orr other harmful materials. The Contractor shall investigate and comply with all applicable Federal, State, County and Municipal laws concerning pollution of rivers and streams.

9.2 Erosion Control. Prior to any major construction the Contractor shall submit a plan for approval of the Contracting Officer showing his scheme for controlling erosion and disposing of wastes contained in the SPECIAL PROVISIONS.

9.2.1 Surface drainage from cuts and fills within the construction limits, whether or not completed, and from borrow and waste disposal areas, shall, if turbidity producing materials are present, be held in suitable sedimentation ponds or shall be graded to control erosion within acceptable limits. Temporary erosion and sediment control measures such as berms, dikes, drains, immediate seeding of cut and fill slopes, or sedimentation basins, if required to meet the above standards, shall be provided and maintained until permanent drainage and erosion control facilities are completed and operative. The area of bare soil exposed at any one time by construction operations should be held to a minimum. Stream crossings by fording with equipment shall be limited to control turbidity. Any temporary culverts or bridge structures shall be removed upon completion of the project. Fills and waste areas shall be constructed by selective placement to eliminate silts or clays on the surface that will erode and contaminate adjacent streams.

9.3 Spillages. Special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, waste washings, herbicides and insecticides, and concrete drainage from entering public waters.

9.4 Washing and Curing Water. Water used in embankment material processing, aggregate processing, concrete curing, foundation and concrete lift cleanup, and other waste waters shall not be allowed to reenter the watercourse if a significant increase in the turbidity of the watercourse will result therefrom. The Contractor shall remove from within the cofferdam all wash, curing, and waste waters derived from sources either within or outside the cofferdam.

9.5 Disposal. Disposal of any materials, wastes, effluents, trash, garbage, oil, grease, chemicals, etc., in areas adjacent to watercourse shall not be permitted. If any waste material is dumped in unauthorized areas, the Contractor shall remove the material and restore the area to the original condition before being disturbed. If necessary, contaminated ground shall be excavated, disposed of as directed by the Contracting OFficer, and replaced with suitable fill material, compacted and finished with topsoil and planted as required to reestablish vegetation.

10. MAINTENANCE OF VIEWPOINT FACILITIES. The viewpoint facilities, including access road and trail system, overlooking the work area shall be maintained in satisfactory condition until completion of the contract. The Contractor shall furnish daily janitorial services for the viewpoint maintenance of facilities and grounds as deemed necessary by the Contracting Officer during the entire life of the contract. Toilet facilities shall be kept clean and sanitary at all times. Services shall be performed at such a time and in such a manner to least interfere with the operations but will be accomplished during normal working hours. Services shall be accomplished to the satisfaction of the Contracting Officer. The Contractor shall also provide daily trash collection and cleanup of the buildings and adjacent outside areas, and shall dispose of all discarded debris in a manner approved by the Contracting Officer. No separate payment will be made for these Contractor-furnished services, and all costs thereof shall be incidental to the various bid items of the contract.

11. PROTECTION OF FISH AND WILDLIFE. The Contractor shall at all times perform all work and take such steps required to minimize interference with or disturbance to fish and wildlife. The Contractor will not be permitted to alter water flows or otherwise disturb native habitat adjacent to the project area which, in the opinion of the Contracting Officer, are critical to fish or wildlife.

12. DISPOSAL OF CLEARED AND GRUBBED MATERIAL AND OTHER DEBRIS.

12.1 General. All debris except for grubbed plant material resulting from construction operations on this contract may, at the Contractor's option, be disposed of in borrow area No. 1. All grubbed plant material with a trunk size of 2 inches or greater shall be shredded and spread uniformly over the borrow area No. 3. Disposed material shall be covered with a minimum of 24 inches of earth material. Compaction other than that obtained by the controlled movement of construction equipment will not be required.

12.2 Burning. No burning permitted.

13. DUST CONTROL. The Contractor will be required to maintain all excavations, embankments, stockpiles, haul roads, permanent access roads, plant sites, waste areas, borrow areas, and all other work areas within or without the project boundaries free from dust which would cause a hazard or nuisance to others. Approved temporary methods of stabilization consisting of sprinkling, chemical treatment, light bituminous treatment or similar methods will be permitted to control dust. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor must have sufficient competent equipment on the job to accomplish this work. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs. No separate or direct payment will be made for dust control and the cost thereof shall be considered incidental to and included in the contract prices for excavation and embankments.

14. MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION. During the life of this contract, the Contractor shall maintain all facilities constructed for pollution control under this contract as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created. During the construction period the Contractor sould conduct frequent training periods on environment protection. The curricula should include methods of detecting and avoiding pollution; familiarity with pollution standards, both statutory and contractual; and installation and care of vegetative covers, plants and other facilities to prevent and correct environmental pollution.

* * * * *

SECTION 2A

DIVERSION AND CONTROL OF WATER

1. REQUIREMENT.

1.1 General. All permanent construction shall be carried on in areas free from water. Water in varying quantities may be flowing in the stream during the entire period of construction. Runoff from the watersheds is rapid and during periods of rain, intermittent freshets may be expected. The responsibility of the Contractor for protection of work against water flows is specified in paragraph entitled "Damage to Work" of Part I, SPECIAL PROVISIONS. At all locations where construction work is at a lower elevation than the elevation of the stream or ground water at the time of doing the work, suitable cofferdams or dikes, if necessary, shall be constructed, the construction area shall be dewatered prior to commencement of the work, and all subgrades, whether for earth fill, filter, stone, or concrete, shall be kept drained and free of water throughout the working period. Within 10 days after award of contract, the Contractor shall submit plans showing the methods he proposes to use to dewater each working area and control the water from rain, sheet flow and other surface water. The plans shall show the scheme of operations and a complete layout of drainage pipes, pumps, diversion channels, cofferdams etc. The plans shall also take into consideration the following specific requirements.

1.2 The schedule for construction operations pertaining to the outlet works, dam embankment and dikes shall be in accordance with the requirements specified in the SPECIAL PROVISIONS.

1.3 The existing Cave Creek Dam may be utilized for diversion and control of water, including floodflows during construction of outlet works and the dam embankment. Approximately 12,400 acre-feet of water may be retained behind the existing dam with 500 cfs being released from the existing ungated outlet.

1.4 By-Pass Capacities.

1.4.1 General. The Contractor shall provide for diversion of stream flows hereinafter specified. The streams flows will include water originating upstream of the work, water from side drains and channels adjacent to the work site and will be in addition to any and all ground water originating within the work. Surface flows in excess of the following runoff quantities listed hereinafter will be regarded as floodflows.

1.4.2 Flows From Existing Cave Creek Dam.

1.4.2.1 Runoff Quantities During Periods 1 April to 30 June and 1 October to 30 November – a stream flow of 10 cfs.

1.4.2.2 Runoff Quantities During Other Periods – a stream flow of 500 cfs.

1.4.3 Flows From Drainage Area Above Dike No. 2.

1.4.3.1 Runoff Quantities During Periods 1 April to 30 June and 1 October to 30 November – a stream flow of 60 cfs.

1.4.3.2 Runoff Quantities During Other Periods – a stream flow of 3,000 cfs.

1.5 Drainage Ditches. The location and depth of any drainage ditches shall be subject to approval of the Contracting Officer. Special precautions shall be taken to avoid impairing the permanent subgrade, and any excavation below the existing streambed or invert subgrade shall be refilled with compacted fill in accordance with section: FILLS AND SUBGRADE PREPARATION by and at the expense of the Contractor.

* * * * *

SECTION 2B

CLEARING AND GRUBBING

1. GENERAL.

1.1 Clearing shall consist of removal of trees, brush, cacti, stumps, vegetable matter, buildings, improvements, and any other items which will interfere with construction operations or are designated for removal. Trees more than one inch in diameter shall be removed to a depth of not less than 12 inches below the ground surface. Other vegetation shall be cut off slightly below the ground surface.

1.1.1 Prior to removal of any cacti, the Contractor shall familiarize himself with the Arizona Native Plant Law Chapter 7, Article 1, Sec. 3-901 which contains important provisions concerning digging, taking, transportation and possession of native cacti. The information may be obtained by calling the Arizona Commission of Agriculture and Horticulture at (602) 271-4373, or writing to 1688 West Adams, Phoenix, Arizona 85007. Removed cacti shall be relocated and transplanted in designated areas as determined by the Contracting Officer. Cacti of Arizona develop tough skin and tissue on the South and Southwest sides of the plants, enabling them to survive extreme temperatures. During removal, the Contractor shall identify the direction in which an individual plant is naturally oriented and transplant in the same orientation to protect the plant from developing sun scald or dying.

1.2 Grubbing shall consist of removal of all stumps and subsurface roots larger than 1-1/2 inches in diameter, matted roots, structures and other objectionable materials. Unless excavation is required, depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original ground surface in accordance with the section: FILLS AND SUBGRADE PREPARATION.

2. REQUIREMENTS.

2.1 Embankment Areas. The following embankment areas shall be cleared and grubbed to the specified contact line (the point where the embankment slope meets the existing ground surface).

2.1.1 Main Dam and Dike No. 2 areas for a distance of 30 feet outside the embankment contact line.

2.1.2 Dike No. 1 for a distance of 20 feet outside the embankment contact line.

2.1.3 Dike No. 3 and Cave Creek Road for a distance of 10 feet outside the embankment contact line.

2.2 Spillway, Outlet Works, Drainage Channel, Outlet Channel, Access and Overlook Roads and Overlook Area Structures shall be cleared and grubbed within the area of construction.

2.3 Borrow Areas. Areas for borrow of fill material shall not be cleared and grubbed until the materials are needed for fill. Clearing and grubbing in the borrow areas shall be limited to the extent necessary to obtain suitable quantities of borrow material.

2.4 Removal of Buildings, Improvements and Stored Man-made Items. All buildings, pavement, improvements and stored man-made items within the construction areas shown on the drawings shall be removed.

3. LIMITS. Trees and other vegetation outside the limits of the areas specified for clearing and grubbing in the paragraph "Requirements" shall be protected in place. No equipment shall pass over or enter areas not to be cleared, except by prior approval of the Contracting Officer and then only as may be required for ingress or egress to areas which require clearing and/or grubbing. The Contracting Officer may require, in some instances, restriction of the movement of equipment, or use of a specific type of equipment in lieu of another or require a certain amount of handwork, in order to insure proper protection of trees, cacti and vegetation to be preserved. The Contractor shall submit for approval drawings showing locations and dimensions of all haul roads and work area outside the limits of areas to be cleared. Drawings for the haul roads shall include plan, profile and cross sections.

4. DISPOSAL OF CLEARJ D AND GRUBBED MATERIAL. All timber to be wasted, logs, brush, stumps, roots, rotten wood, and other refuse shall be disposed of as specified in the section: ENVIRONMENT PROTECTION.

* * * * *

SECTION 2F

DETOUR

1. DETOUR. The Cave Creek Road detour will be constructed maintained and removed by others. The detour will be constructed as shown and will allow for continuous 2-way traffic use 24 hours a day. The Contractor shall not cross the detour with construction equipment except at approved crossings. The Contractor shall provide a flagman or guard at the crossing during all working hours. Crossings shall be maintained in accordance with applicable State and county requirements.

* * * * *

SECTION 2J

STRIPPING

1. REQUIREMENT. The Contractor shall strip the areas indicated on the drawings. Borrow areas not indicated to be stripped shall be stripped as required to obtain material suitable for the required fills.

2. DISPOSAL. Stripped materials not used in the work shall be disposed of in the borrow areas after completion of excavation therefrom. Stripped materials may be temporarily used for diversion and control of water.

2.1 Streambed Dam. Materials suitable for Zone III embankment and riprap shall be placed in those portions of the dam structure as applicable. Stockpiling may be required.

2.2 Dike Foundations. Material suitable for Zone II embankment may be stockpiled and placed in the Zone II embankments of the dikes.

2.3 Borrow Area For Zone I Material. The upper 24 inches of material stripped from borrow area for Zone I material shall be stockpiled and used as topsoil in seeded areas as specified in Section: SEEDING. Material in borrow areas not suitable for embankments and stripped material not used for topsoil in the seeded areas shall be stockpiled adjacent to the borrow area and upon completion of excavation therefrom shall be spread uniformly over the excavated surfaces of the borrow area. Compaction will not be required.

* * * * *

SECTION 3A

EXCAVATION

Index

1. Requirements
2. Scaling
3. Excavation, Abutment
4. Excavation, Foundation, Dam
5. Excavation, Cutoff Trench
6. Excavation, Dental
7. Excavation, Foundation Trench
8. Excavation, Outlet Works
9. Excavation, Outlet Works Channels
10. Excavation, Drainage and Bypass Channels
11. Excavation, Spillway
12. Excavation, Borrow Areas
13. Excavation for Buildings and Other Structures
14. Excavation, Access Road and Overlook Area
15. Excavation, Ditch
16. Excavation, Drains or Culverts
17. Blasting

1. REQUIR :MENTS.

1.1 General. Excavation as used in these specifications consists of the removal of rock, boulders, cobbles, earth, sand and gravel, clayey soils, silty sand, and any other materials encountered, and the transportation of such materials to designated construction or waste areas as required. "Rock" is defined as: solid bedrock, decomposed bedrock and boulders and blocks 1/2 cubic yard or more in volume. All blasting shall conform to the requirements specified in the paragraph entitled "Blasting." The composition of the excavated material rather than the source of its excavation, shall determine the location of its placement. Any excavation or overcut made outside the payment lines indicated on the drawings or staked in the field shall be refilled with suitable earth or concrete in an approved manner by and at the expense of the Contractor, except where such over cut is directed or specified, in which case payment for such overcut and fill will be made at the applicable contract unit prices for the type of excavation and fill made. All excavation shall be performed in a manner which will not impair the subgrade. Except as otherwise directed or specified the finished surface of subgrade which will form the foundation for concrete structures except for excavation in rock shall be not more than 1/2 inch from the indicated grade at any point when tested with 10-foot straightedge.

1.2 Equipment. All plant, equipment, tools, and machines used in the performance of the work covered by this section shall be subject to the approval of the Contracting Officer, and shall be maintained in satisfactory working condition at all times. Excavating equipment used in the areas from which fill and borrow materials are obtained shall be capable of producing the necessary blending required to consistently meet the specified gradation requirements.

1.3 Excavation Limits. Limits of excavation for the various structures and parts of the work are as indicated on the drawings but the right is reserved to increase or decrease the depth or areal extent of excavation if, in the opinion of the Contracting Officer, the conditions encountered warrant such modification. Except as otherwise directed, the Contractor shall make all excavations to the profiles and sections shown.

1.4 Tolerances for Rock Excavation. Deviations from the lines and grades shown on the drawings or established by the Contracting Officer for excavation in rock shall be within tolerance limits of 9-inches, except for those excavations against which concrete structures are to be constructed. Excavations for concrete structures have certain reference lines desginated as "A" line and "B" line. The "A" line is located 9 inches above the "B" line in all inverts and 6 inches inside the "B" line in all walls. The "A" line represents the inner tolerance limit inside which no rock will be permitted to project. Any projections inside of "A" line shall be removed. No timbering will be permitted to remain inside of the "A" line. "B" line is the line to which measurement for payment of excavation will be made, and is considered to be the final excavation line indicated on the drawings. Measurement for payment will be made to this line regardless of whether the limit of the actual excavation fall inside or outside of it, but, sufficient excavation inside of this line shall be performed to provide for the proper installation of steel reinforcement and placement of concrete. Any excavation beyond the "B" line shall be replaced with appropriate material complying with applicable portions of these specifications without additional cost to the Government.

1.5 Disposal of Excavated Material. Excavated material determined suitable for embankment, dike fills or stonework shall be placed in the embankment, dike, fill and stone protection areas as directed or approved by the Contracting Officer, or shall be temporarily stockpiled for later use, except as otherwise specified hereinafter. The gradation of the excavated material will determine the areas of placement. Excavated material determined unsuitable for embankment shall be disposed of in the borrow areas (after excavation therefrom) as specified herein. Upon completion of the work all temporary stockpile areas shall be so graded that adequate drainage will be provided and shall be smoothly and evenly dressed and left in a neat and satisfactory condition in accordance with the sections: SEEDING and ENVIRONMENT PROTECTION. Disposal of material in borrow areas shall be performed in such a manner that the amount of material in each borrow area selected for disposal purposes is equally divided between the areas. The material shall be placed in uniformly, even layers and shall be uncompacted except for that obtained from the movement of the equipment.

1.5.1 Excess Stone. Except for excess stone from Borrow Area No. 5, excess stone material larger than 6 inches in size shall be stockpiled in the streambed downstream of the toe of the dam embankment as directed. Excess stone material larger than 6 inches in size from Borrow Area No. 6 shall be stockpiled adjacent to Borrow Area No. 6 as directed.

2. SCALING consists of the removal and disposal of bedrock material from vertical and over-hanging rock ledges on the abutments, within the cutoff trench below streambed, and elsewhere as directed. The required scaling will be indicated on the ground surface with stakes, paint or like means by the Contracting Officer. All objectionable materials, including overburden, weathered and intensely fractured rock, and detached blocks and slabs, shall be removed to a suitable foundation rock. Large rock overhangs and protrusions shall be removed to a relatively uniform slope by means of line drilling and blasting. The abutments above streambed shall be scaled and final quantity surveys made prior to cutoff trench excavation. Material excavated from the areas scaled shall be disposed of in the designated waste areas. Scaling within 100 feet of areas to be grouted shall be completed prior to commencement of grouting operation.

3. EXCAVATION, ABUTMENT. This excavation consists of the removal and disposal of all material between the existing ground surface and the top of bedrock or as indicated on the drawings.

4. EXCAVATION, FOUNDATION, DAM. Foundation excavation consists of the removal and disposal of all material between the dam embankment stripping line to elevation 1,558 ft. or bedrock whichever is encountered first.

5. EXCAVATION, CUTOFF TRENCH. Cutoff trench excavation consists of the removal and disposal of all material between the elevation 1,558 and the top of bedrock and the limits indicated. All loose boulders and debris shall be removed from the sides and bottom of the trench.

6. EXCAVATION, DENTAL. It is anticipated that localized zones of dental excavation consisting of scour channels, pot holes and other conditions not suited for slurry grouting in the core trench foundation, will be encountered as the work progresses, particularly in the cutoff trench below streambed. Such areas shall be cleaned and the materials removed and disposed or used in the work as directed by the Contracting Officer. When conditions are such that unsuitable materials must be removed using hand methods for excavation, all materials removed in this work will be classified as "Excavation, Dental," regardless of composition. The Contracting Officer will determine, in the field, the extent to which such material shall be removed, including the depth, direction and dimensions of the excavations.

7. EXCAVATION, FOUNDATION TRENCH. Foundation trench excavation consists of the removal and disposal of all materials between the Dike No. 2 stripping line and the bottom of the trench as indicated on the drawings.

8. EXCAVATION, OUTLET WORKS. Excavation consists of the removal and disposal of all materials from the outlet works conduit and related structures to the lines and grades indicated on the drawings. Excavation methods shall be controlled to prevent damage to the rock outside of prescribed limits of excavation. If damage occurs due to excavation methods utilized, the Contractor shall discontinue his operation and complete excavation work by the smooth blasting method specified in the paragraph: BLASTING.

9. EXCAVATION, OUTLET WORKS CHANNELS. Excavation consists of the removal and disposal of all materials from t e outlet works channels, to the lines and grades indicated on the drawings.

10. EXCAVATION, DRAINAGE AND BYPASS CHANNELS. Excavation consists of the removal and disposal of all materials from the drainage and bypass channels to the lines and grades indicated on the drawings.

11. EXCAVATION, SPILLWAY. Excavation consists of removal and disposal of all materials, from the spillway and related structures to the lines and grades indicated on the drawings. Excavation methods shall be controlled to prevent damage to the rock outside of prescribed limits of excavation. If damage occurs due to excavation methods utilized, the Contractor shall discontinue his operation and complete excavation work by the smooth blasting method specified in the paragraph: BLASTING.

12. EXCAVATION, BORROW AREAS. Borrow shall be taken from the borrow areas indicated on drawings at the locations directed. The depth of cut in all borrow areas shall at all times be subject to approval of the Contracting Officer. Material in the Zone I and Zone II borrow areas shall be excavated with an inclined or vertical cut face for the full depth designated in each borrow area. Excavation in the Zone I and Zone II borrow areas shall be performed in a manner which will produce maximum blending of materials from top to bottom of the excavation. In all borrow areas, moisture shall be added before the excavation and/or during the blending if mixing plants are used. All borrow material shall be blended and moistened for the full depth of excavation prior to placing the materials on the embankment to meet the requirements specified in section: EMBANKMENT AND FOUNDATION PREPARATION. The methods proposed for transporting material from the borrow areas to the embankment shall be submitted for approval prior to use. If haul roads are required, the Contractor shall construct and maintain such roads. Upon completion of excavation in the borrow areas all slopes shall be 1 vertical on 5 horizontal or flatter and the areas shall be left in a neat condition, graded to drain and in accordance with the

requirements specified in section: ENVIRONMENT PROTECTION. Unsuitable materials shall be wasted as directed. Whenever, in the opinion of the Contracting Officer, it is necessary to change the location of the excavating equipment working in borrow areas in order to obtain suitable material, the Contractor shall move his equipment to the new designated location at no additional cost to the Government.

13. EXCAVATION FOR BUILDINGS AND OTHER STRUCTURES. The excavation shall conform to the dimensions and elevations indicated on the drawings for each building or structure, except as specified below, and shall include all work incidental thereto. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms, and for inspection, except where the concrete for walls and footings is authorized to be deposited directly against excavated surfaces. Undercutting will not be permitted. Where acceptable foundation materials are encountered at different elevations from those indicated on the drawings, the Contracting Officer may direct in writing that the excavation be carried to elevations above or below those indicated on the drawings. Unless so directed, excavations shall not be carried below the elevations indicated on drawings and care shall be taken not to disturb the bottom of the excavation. Where the excavation is made below the elevations indicated on the drawings or directed by the Contracting Officer, the excavation, if under slabs, shall be restored to the proper elevation in accordance with the procedure specified for backfill, or if under footings, the heights of the walls or footings shall be increased, as may be directed by the Contracting Officer. The Contractor shall control the grading in the vicinity of buildings so that the surface of the ground will be properly sloped to prevent water from running into the excavated areas. Any water that accumulates in the excavation shall be removed promptly.

14. EXCAVATION, ACCESS ROAD AND OVERLOOK AREA. The excavation for the access roads and overlook area shall consist of the removal and disposal of all materials to the lines, grades, and elevations indicated on the drawings. Suitable material excavated from the access and overlook area roads shall be placed within the fill portions of the roads.

15. EXCAVATION, DITCH. This excavation shall be done by cutting accurately to the cross sections and grades indicated on the drawings and as directed by the Contracting Officer. Care shall be taken not to excavate ditches below the grades indicated. Excessive ditch excavation below invert grade shall be backfilled with suitable stone or cobble to form an adequate gutter paving. The Contractor shall maintain all ditches excavated under this specification until final acceptance of the work.

16. EXCAVATION, DRAINS OR CULVERTS. All excavation shall be performed to the depths indicated or as otherwise specified. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or suitable for backfill shall be removed and wasted. Grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other approved methods. Sheeting and shoring shall be constructed as necessary for the protection of the work and for the safety of personnel. Trenches shall be of the necessary width for proper laying of pipe and ducts. The banks of pipe trenches shall be as nearly vertical as practicable. Care shall be taken not to overexcavate. The bottom of the trenches shall be accurate graded to provide uniform bearing and support for each section of the pipe or duct on unidsturbed soil at every point along its entire length, except for the portions of the pipe sections where it is necessary to excavate for the proper sealing of pipe joints and as hereinafter specified. Concrete anchors, footing of concrete blanket, and depressions for joints shall be dug after the trench bottom has been graded, and, in order that the pipe rest on the prepared bottom for as nearly its full length as practicable, excavation shall be only of such length, depth, and width as required for properly making the particular type of joint. Stones shall be removed as necessary to avoid point bearing. Where rock excavation is required in trenches for pipe, the rock shall be excavated to a minimum overdepth of 6 inches below the trench depths indicated or specified. Except as hereinafter specified for wet or otherwise unstable material, overdepths shall be backfilled as and with materials specified for backfilling the lower portion of trenches. Whenever wet or otherwise unstable material that is incapable of properly supporting the pipe, as determined by the Contracting Officer, is encountered in the bottom of the trench, such material shall be removed to the depth required and the trench backfilled to the proper grade with coarse sand, fine gravel or other suitable approved material.

17. BLASTING.

17.1 Safety Requirements. For these requirements reference is made to the paragraph: ACCIDENT PREVENTION in the GENERAL PROVISIONS. Blasting will be permitted only when precautions are taken for the protection of persons, the work, and property. Any damage to the work or property shall be repaired by the Contractor at no expense to the Government.

17.2 General.

17.2.1 The Contractor shall submit 3 copies of drawings of blasting proposals and blasting schedules for approval before starting any blasting in any area, showing the position and spacing of drill holes, types of explosives proposed for use, position and size of each charge, and the timing schedule for detonating the charges. Use of non-electric blasting caps is prohibited.

17.2.2 The Contractor shall control the blasting procedures so as not to overshoot and will be required to remove, at his own expense, any material outside the authorized lines and grades indicated on the drawings which may be shattered or loosened by such blasting.

17.2.3 During blasting operations the Contractor shall have on the site, and in immediate charge of the blasting and rock excavation, a blasting expert acceptable to the Contracting Officer, who has had no less than 3 years of continous experience in blasting and rock excavation operations. Powder handlers shall have had no less than one year of continuous experience in preparation and loading of powder charges.

17.2.4 Variations of smooth blasting procedures as described herein will be permitted providing the Contractor demonstrates that the substitute procedure will achieve an equivalent sound rock face at the final excavation lines.

17.3 Smooth Blasting.

17.3.1 Smooth blasting will be required within the areas indicated for the spillway and outlet excavation and such other areas as directed. The explosives shall be of such strength and quantity and shall be used in such a manner as will neither open seams nor otherwise damage the rock outside of prescribed limits of excavation. In the spillway areas, where smooth blasting is required, buffer zones shall be provided as indicated. Blasting in the buffer zone shall be performed in a manner which will produce relatively smooth and sound rock faces at the preliminary and final excavation lines. As the excavation approaches the preliminary and final excavation lines the depth and spacing of blast holes and the amount of explosive shall be varied with the field conditions to prevent damage to the rock faces. Whenever, in the opinion of the Contracting Officer, blasting may injure the cut slopes or rock upon which or against which concrete is to be placed, the use of explosives shall be discontinued and the excavation shall be completed by wedging, barring, channeling and broaching, or other suitable methods. Any damage to or displacement of supports and any damage to any other part of the work caused by blasting shall be repaired by and at the expense of the Contractor and in a manner satisfactory to the Contracting Officer. No blasting will be permitted within 100 feet of concrete which has been in place less than 7 days, nor within 100 feet of a grouted area.

17.3.2 Excavation outside of the buffer zone shall be performed prior to any work on the buffer zones. Blasting of the buffer zones shall be done in comparatively small rounds. The rock forming the buffer zones on the side slopes shall be removed in succesive thin slices commencing with the slice adjacent to the free face of the buffer zone, indicated as the as the preliminary excavation line on the drawings, and advancing progressively to the final excavation line. The slices shall be parallel to the final excavation line. Multiple-row rounds shall be used with regular or long period delays between rows rather than short period or millisecond delays. The delays shall be selected to provide sufficient time between detonation of rows to allow each outer slice to clear the face prior to detonation of the next row. The spacing between the rows of blast holes and the spacing between the blast holes in the individual rows in the buffer zones shall be varied to produce a sound wall at the final excavation line except that the spacing between blast holes on the final excavation lines shall not exceed those indicated on the drawings, or as directed.

17.3.3 Blasting of the horizontal buffer zone above the spillway invert shall be done by use of successive rows of blast holes drilled perpendicular to the invert. The spacing of the vertical rows of blast holes shall not exceed 36 inches and the spacing between holes in a row shall not exceed 30 inches or as directed.

17.3.4 Ammonium nitrate type explosives shall not be used in any of the buffer zones and shall not be used within 10 feet in advance of the preliminary excavation lines.

17.4 Demonstration of Capability. The capability of the Contractor to perform any blasting technique shall be demonstrated at a point no closer than 10 feet from a preliminary excavation line. If a demonstration does not produce results satisfactory to the Contracting Officer, the Contractor shall modify his technique and perform such demonstrations as are necessary to produce the desired results.

17.5 Records. The Contractor shall keep and furnish to the Contracting Officer accurate logs and records of all operations pertaining to the preparation, drilling, blasting and excavation procedures. The records shall be submitted daily with the Quality Control Report and shall include the following.

17.5.1 The number, size, type, and make of all equipment used in the excavation process.

17.5.2 The number size, depth, direction, and spacing of drill holes utilized for each round of blasting, to include a plan sketch drawing.

17.5.3 The quantity, type, strength and stemming of explosives used in blasting each drill hole.

17.5.4 The type, make, and system of detonation used for each round of blasting.

17.5.5 The volume of rock excavated from each round of blasting.

17.5.6 Any unusual drilling or blasting occurrences.

* * * * *

SECTION 3B

FILLS AND SUBGRADE PREPARATION

Index

1. Applicable Publications
1A. General
2. Equipment
3. General Requirements for Compacted Fills and Compacted Backfills
4. Compacted Fill, Outlet Works
5. Compacted Fill, Roads
6. Backfills
7. Miscellaneous Fill
8. Subgrade Preparation
9. Topsoil and Landscape Fill

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 American Society for Testing and Materials (ASTM) Publications.

D 698-70	Moisture-Density Relations of Soils Using a 5.5-Lb. Rammer and a 12-In. Drop
D 1557-70	Moisture-Density Relations of Soils Using 10-Lb. Rammer and 18-In. Drop
D 1556-64 (1974)	Density of Soil In Place by the Sand-Cone Method

1.2 American Association of State Highway and Transportation Officials (AASHTO) Standards.

T 99-70	Moisture-Density Relations of Soils Using a 5.5-Lb. Rammer and a 12-In. Drop
T 180-74	Moisture-Density Relations of Soils Using a 10-Lb. Rammer and an 18-In Drop
T 191-61 (1974)	Density of Soil In-Place by the Sand Cone Method

1A. GENERAL. This section includes the requirements for all compacted fills topsoil, landscape fill and backfills, except fills within the dam, spillway and dike structures which are covered in section: EMBANKMENTS AND FOUNDATION PREPARATION.

2. EQUIPMENT. All equipment, tools, and machines shall be maintained in satisfactory working condition at all times. Compaction equipment shall be suitable for consistently producing uniform soil densities.

3. GENERAL REQUIREMENTS FOR COMPACTED FILLS AND COMPACTED BACKFILLS.

3.1 Control. Moisture-density relations shall be established by the Contractor. Field density tests shall be performed by the Contractor in sufficient number and in such locations to insure that the specified density is being obtained. Moisture-density relations and field densities shall be reported on approved forms. One copy of density data less dry weight determinations shall be provided on the day each test is taken. The completed test reports shall be provided with the Contractor Quality Control Report on the work day following the test.

3.1.1 Laboratory Control. One moisture-density relation shall be made for each classification, blend or change in classification of soil materials encountered. Approval of moisture-density relations shall be obtained prior to the compaction of any material in the work. The moisture-density relations shall be determined in a laboratory in accordance with the following requirements:

3.1.1.1 Outside of Road Rights-of-Way. AASHTO Standard T 99, Method D or ASTM Specification D 698, Method D, modified as specified hereafter.

3.1.1.2 Within Road Rights-of-Way. AASHTO Standard T 180, Method D, or ASTM Specifications D 1557, Method D, modified as specified hereafter.

3.1.1.2.1 All material over 3/4 inch in size will be removed and replaced with an equal portion of material between 0.187 inch, No. 4 sieve, and 3/4 inch in size.

3.1.1.2.2 A separate batch of materials will be used for each compaction test specimen. No materials will be re-used.

3.1.1.2.3 The desired amount of mixing water will be added for each compaction test specimen, mixed well, and the mixture will be placed in a container with an airtight cover and allowed to cure for 24 hours. A shorter curing time may be allowed where tests show that shortening the curing time will not affect the results.

3.1.2 Field Control. Field in-place density shall be determined in accordance with AASHTO Standard T 191 or ASTM Specifications D 1556, except that in each test, the weight of the disturbed sample representing the full depth of layer shall be not less than 10 pounds for fine grain material and 12 pounds for coarse grain material using a scale for weighing of sufficient capacity and sensitive to .01 pounds. The density tests shall be well distributed and shall average not less than one test for each 400 cubic yards of material. At least one test shall be made in each 2 feet of compacted material processed as a unit and at least one test shall be made in each area.

3.1.3 Moisture-Density Curves for Cohesionless and Cohesive Materials. Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture density curves.

3.2 Settling of Fills or Backfills With Water will not be permitted, except as specified hereinafter for sand fill and filling voids behind walls.

3.3 Material shall be obtained from the required excavations and/or borrow areas, shall be free from sod, roots, brush, debris, trash or other objectionable material, and shall contain no stone whose greatest dimension is more than 6 inches. Material shall meet the gradation requirements for Zone III material as specified in the section: EMBANKMENTS AND FOUNDATION PREPARATION.

3.4 Placement. Fill material shall not be placed against concrete which has not been in place at least 14 days or until the concrete has attained a strength of 2,500 p.s.i. when tested in accordance with the section: CONCRETE CONSTRUCTION. Heavy equipment shall not be operated over pipes and buried structures until at least 2 feet of fill material has been placed and compacted over them in conformance with the requirements of the paragraph: BACKFILL, PIPE TRENCHES. Compacted fill and backfill shall be placed with suitable equipment in horizontal layers which after compaction, shall not exceed 12 inches in depth for rubber-tired or vibratory rollers, 6 inches in depth for tamping rollers, and 4 inches in depth when mechanical tampers are used. The Contractor may vary the layer thickness within these limits for most efficient operations. Material containing stones shall be placed in a manner to prevent the stones from striking the concrete structures and to prevent the formation of voids.

3.5 Moisture Content. Material shall have a uniform moisture content while being placed and compacted. Water shall be added at the source, if required, or by sprinkling each layer of material during placement. Uniform distribution of moisture shall be obtained by disking, harrowing, or otherwise manipulating the soil during and after the time water is added. Material containing an excess of moisture shall be manipulated with suitable implements to facilitate maximum aeration and shall be permitted to dry to the proper consistency before being compacted. Fill shall have a maximum moisture content of not more than 3% above optimum and a minimum moisture content of not less than 2% below optimum.

3.6 Compaction. No layer of fill shall be compacted before the practicable uniform moisture content has been obtained. Scarified areas shall be compacted as specified for the fill placed thereon. Rollers will not be permitted to operate within one foot of channel or structure walls or over buried structures until the compacted fill over the top of the structures has reached a depth of 2 feet. Compaction equipment shall be so operated that structures are not damaged nor overstressed during compaction operations. Mechanical tampers shall be used for compaction of fill material adjacent to structures where rolling equipment is impracticable for use in compaction.

4. COMPACTED FILL, OUTLET WORKS.

4.1 Behind Energy Dissipator Walls.

4.1.1 Limitations on Equipment. The gross weight of any piece of equipment, or the combined weight of any combinations of equipment coupled together, used to place, moisten and/or compact fill behind walls and shall not exceed 35,000 pounds, including dynamic forces produced by vibratory equipment. Equipment used to compact the fill behind the walls shall be of such size as to be capable of operating in the area between the cut slope and the channel wall. Compaction equipment will not be required to operate at elevations lower than 2 feet above the top of wall footings. This equipment shall be of such size as to be capable of operating in the area between the cut slope and the wall at any point 2 feet above the top of the heel of wall footings.

4.1.2 Construction Balance. Fills behind walls on one side of the channel shall not exceed by more than 5 feet the height of the fill behind the opposite wall at any time during construction.

4.1.3 Compaction. Each layer of fill behind walls shall be compacted to not less than 90% of maximum density.

4.1.4 Trimming. The berms top of fill adjacent to walls shall be trimmed to the lines indicated on the drawings with a tolerance of plus or minus one inch. Any material loosened by trimming shall be recompacted and the berm area moistened and compacted with one pass of a smooth-wheeled roller. Tolerances shall apply after rolling. The fill slopes shall be trimmed to a uniform alignment at top of berm and to a reasonably uniform slope at or outside the lines shown on the drawings.

4.2 Berms along the outlet channel, downstream of the energy dissipator.

4.2.1 Preparation for Placing. Before placing material for compacted fill, the foundation surface shall be cleared of all existing obstructions, vegetation, and debris. Unsuitable material not meeting the requirements for fill material shall be removed where directed, and the existing surfaces scarified to a depth of 6 inches before placing the fill. Sloped ground surfaces steeper than one vertical to 4 horizontal, on which fill or compacted backfill is to be placed, shall be stepped in such a manner that the compaction equipment will bear on the full depth of the fill layer.

4.2.2 Compaction. Each layer of berm fill for channel construction shall be compacted to not less than 90% of maximum density.

4.2.3 Trimming. The channel side and top of berms shall be trimmed to the lines indicated on the drawings with a tolerance of plus or minus one inch, as measured perpendicular to the slope. Any material loosened by trimming shall be recompacted. The land side of levees shall be trimmed to a uniform alignment at top of levee and to a reasonably uniform slope at or outside the lines shown on the drawings. The ramps and bridge approach areas other than paved areas shall be trimmed to a uniform alignment and reasonably uniform slopes.

5. COMPACTED FILL, ROADS.

5.1 Location. Compacted road fill shall consist of fill placed for road and parking area construction, and all other fill and backfill within the road right-of-way.

5.2 Compaction. Each layer of road and parking area fill shall be compacted to not less than 90% of maximum density, except the upper 1.0 foot of fill shall be compacted to not less than 95% of maximum density.

5.3 Trimming. All shoulders and side slopes shall be neatly and accurately trimmed to the cross section indicated.

6. BACKFILLS.

6.1 Backfill and Fill About Structures.

6.1.1 Location. Backfill and fill shall consist of all fill against and/or around structures, except backfill for pipe trenches.

6.1.2 Material. Backfill and fill material shall be obtained from the required excavation as approved by the Contracting Officer. In general, the best material available will be designated as backfill and fill about structures. Backfill may consist of sand, gravelly sand, silty sands, sandy silts, clayey sands, and sandy clays. Organic material, silt, clay, broken concrete or pavement, boulders and other objectionable material shall not be used.

6.1.3 Placing. Fill material shall not be placed against concrete which has not been in place at least 14 days or until the concrete has attained a strength of 2,500 p.s.i. when tested in accordance with section: CONCRETE CONSTRUCTION. Fill shall be placed in 4-inch layers.

6.1.4 Compaction shall be not less than 95% of maximum density.

6.2 Backfill, Pipe Trenches.

6.2.1 Location. Backfill for pipe trenches shall consist of all fill placed in pipe trench or open excavation for pipes or drains.

6.2.2 Material shall conform to the requirements in paragraph: BACKFILL AND FILL ABOUT STRUCTURES except that the material placed around the pipe and until the pipe has a cover of 2 feet, shall not contain any stone larger than 3/4 inch. Bedding under the pipe shall consist of compacted sand.

6.2.3 Placing. Backfill shall be placed in 4-inch layers.

6.2.4 Compaction of the material around the pipe, and until a pipe has a cover of 2 feet, shall be not less than 90% of maximum density. The compaction of the remainder of backfill shall be not less than 95% of maximum density.

7. MISCELLANEOUS FILL shall consist of material from the required excavation, placed in the area indicated and shall be placed with suitable equipment in layers which shall not exceed 24 inches in depth before consolitation. Broken concrete, rock, and bituminous paving to be wasted may be buried in the larger miscellaneous fill areas, provided such material is placed in a manner that will prevent the formation of voids and provided it is placed not less than 2 feet below finished grade and not less than 2 feet horizontally from concrete construction. No depressions in which water might pond shall be left in miscellaneous fill areas. The finished areas shall be sloped to drain. Compaction other than that obtained by the controlled movement of the construction equipment will not be required.

8. SUBGRADE PREPARATION.

8.1 Subgrade Preparation for Roads and Parking Area. The subgrade shall be alternately watered and scarified until the material is uniformly moistened throughout for a depth of not less than 4 inches. All stones larger than 4 inches in diameter, and hard ribs of earth shall be removed. The amount of water to be applied shall be that which is required to provide optimum results in compaction under rolling. Following the above operations, the roadbed shall be shaped to a true cross section sufficiently higher than the specified grade to allow for subsequent compaction and then be thoroughly compacted to not less than 95% of maximum density. After the subgrade has been prepared and completed, the surface shall be firm, hard, and unyielding, with a true, even, and uniform surface conforming to the grade and cross section indicated on the drawings. All points of the finished subgrade shall be not more than 1/4 inch below or above true subgrade.

9. TOPSOIL AND LANDSCAPE FILL.

9.1 Materials.

9.1.1 Topsoil material shall conform to the requirements of Zone I material, except the maximum size shall not exceed 6 inches, and shall be obtained by stripping the upper 24 inches of borrow area No. 4.

9.1.2 Landscape Fill Material shall conform to the requirements of Zone III material except the maximum size shall not exceed 3 inches.

9.2 Placement. Topsoil and Landscape Fill shall be spread over the stonework to an average thickness of 6 inches, to fill all voids and leave the finished surface smooth and uncompacted so that minimum preparation will be required for seeding.

* * * * * *

SECTION 3C

EMBANKMENTS AND FOUNDATION PREPARATION

Index

1. Applicable Publications
2. Definitions
3. General
4. Materials
5. Preparation of Foundation Partial Fill Surfaces and Abutments
6. Placement
7. Moisture Control
8. Compaction
9. Miscellaneous Fill
10. Backfill
11. Slides

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 American Society for Testing and Materials (ASTM) Publication.

C 136-71	Sieve or Screen Analysis of Fine and Coarse Aggregates

2. DEFINITIONS. The term "embankment" as used in these specifications is defined as the earth fill portions of the dam, spillway and dikes and includes all types of earth fill materials for these structures and all other specified or directed earth fills within the limits of these structures excepting those stone and filter materials used for slope protection, which are specified in section: STONE PROTECTION. Compacted fill includes all fill, except backfill, deposited in layers and compacted by rolling or tamping. The types of compacted earth fill are as indicated and specified herein. Backfill as used in these specifications, is defined as that excavation refill which cannot be placed around or adjacent to a structure until the structure is completed or until a specified time interval has elapsed after completion.

3. GENERAL.

3.1 Grade Control. The embankments shall be constructed to the lines, grades and cross sections indicated on the drawings, unless otherwise directed by the Contracting Officer. The Government reserves the right to increase or decrease the foundation widths, to modify the embankment slopes, or to make such other changes in the embankment sections as necessary to meet field conditions and produce a safe structure. The end slopes and side slopes of partial fill sections shall not at any time be steeper than the slopes shown for the completed fill section.

3.2 Conduct of The Work. The Contractor shall maintain and protect the embankment in a satisfactory condition at all times until final completion and acceptance of all work under the contract. If in the opinion of the Contracting Officer the hauling equipment causes horizontal shears, slickensides, rutting, quaking, heaving, cracking or excessive deformation of the embankment, the Contractor shall limit the type, load or travel speed of the hauling equipment on the embankment. Any approved embankment material which is lost in transit or rendered unsuitable after being placed in the embankment and before final acceptance of the work, shall be replaced by the Contractor in a satisfactory manner and no additional payment will be made therefor. The Contractor shall excavate and remove from the embankment any material which the Contracting Officer considers objectionable and shall also dispose of such material and refill the excavated area as directed, all at no cost to the Government. The Contractor may be required to remove, at his own expense, any embankment material placed outside of prescribed slope lines.

3.3 Haul Roads. Haul roads shall be located and constructed as approved by the Contracting Officer. They shall be designed to maintain the intended traffic, to be free draining and shall be maintained in good condition throughout the contract period, unless otherwise directed by the Contracting Officer. Haul roads within the area of contact between the embankment and its foundation and abutments shall be removed and the area shall be treated as specified in paragraph: PREPARATION OF FOUNDATION, PARTIAL FILL SURFACES AND ABUTMENTS.

3.4 Stockpiling from Borrow Sources. When the excavation from borrow sources progresses at a faster rate than placement in the fill is being accomplished, such excavated material shall be stockpiled at approved locations adjacent to the work until its use is authorized. No payment will be made for such stockpiling nor for the reloading and hauling of this material to its final position in the embankment.

4. MATERIALS.

4.1 General. The origin of any fill material in no way determines where it may be used in the embankment. Materials for embankment fills shall be secured from required excavations and from the borrow areas indicated. The intention is to use the most suitable materials obtainable from these sources. Material to be wasted will be specifically designated by the Contracting Officer at the time the material is excavated. Materials containing brush, roots, sod or other perishable materials will not be considered suitable. The suitability of the materials shall be

subject to the approval of the Contracting Officer and their disposition in the embankment shall be as directed by the Contracting Officer. The Contractor shall excavate in the borrow areas in the location determined by the Contracting Officer, whenever such control is necessary to obtain the type of material required for the embankment. Blending of materials during the excavating process at the borrow area will be required. Fill material shall meet the required gradations specified hereinafter. Gradations shall be determined on materials less than 3 inches in size in accordance with ASTM C 136.

4.2 Zone I (Impervious Fill). Material for compacted Zone I fill shall consist of clays, silty clays, clayey silts or sandy clays obtained from the designated borrow area. Material shall have not less than 70 percent, by weight, passing the U.S. Standard No. 200 sieve.

4.3 Zone II (Random or Transition Fill). Material for compacted Zone II fill shall consist of sandy clays, sandy silts, clayey sands or silty sands obtained from the designated borrow areas or required excavation. Material shall contain no stone whose greatest dimension is more than 3/4 of the layer thickness. Not more than 60 percent and not less than 20 percent of the material, by weight, shall pass the U.S. Standard No. 200 sieve.

4.4 Zone III (Pervious Fill). Material for compacted Zone III fill shall consist of gravelly sand or sandy gravel obtained from the required excavation or designated borrow areas. Material shall contain no stone larger than 18 inches and shall have not more than 12 percent, by weight, passing the No. 200 sieve.

4.5 Miscellaneous Fill. Except as otherwise required by the Contracting Officer, material for miscellaneous fill may consist of any or all types of material available from required excavations and designated borrow areas.

4.6 Backfill. Backfill shall consist of material of a type and quality conforming to that specified for the contiguous embankment fill material, unless otherwise indicated on the drawings or directed by the Contracting Officer.

5. PREPARATION OF FOUNDATION, PARTIAL FILL SURFACES AND ABUTMENTS.

5.1 Earth. After excavation and stripping of the embankment foundations and excavation of the cut-off and foundation trenches to the extent indicated on the drawings or otherwise required, the sides of stump holes, test pits, and other similar cavities or depressions shall be broken down, so as to flatten out the slopes, and the sides of the cut or hole shall be scarified to provide bond between the foundation material and the fill. The slopes and bottom of the cut-off and foundation trenches shall be scarified as directed by the Contracting Officer. Unless otherwise directed, each depression shall be filled with material dependent upon the type of material which is to be placed immediately above the foundation. The fill shall be placed in layers, moistened, and compacted in accordance with the applicable requirements specified hereinafter. Materials which cannot be compacted by roller equipment because of inadequate clearances shall be spread in 6-inch layers and compacted with power tampers to an extent equal to that of the contiguous embankment fill material. After filling of depressions and immediately prior to placement of compacted fill in any section of the embankment, the foundation of such section shall be loosened thoroughly by scarifying, plowing, discing or harrowing to a minimum depth of 12 inches and the moisture content shall be adjusted to the amount specified for the appropriate type of material, except in areas where this requirement is waived by the Contracting Officer. After removal of roots or other debris turned up in the process of loosening, the entire surface of the embankment foundation area shall be smoothed so that no stone or boulder protrudes above the surface more than 6 inches. After smoothing and before placing any fill the foundation area shall be compacted by 10 complete passes of the rubber-tired roller as hereinafter specified. Prior to placement of compacted fill on or against the surfaces of any partial fill section, all soft or loose material, all material containing cracks or gullies, and all material that does not conform with the specified zoning of the embankment shall be removed. The remaining surface of the partial fill shall be loosened by scarifying, plowing, discing or harrowing to a minimum depth of six inches, and the moisture content shall be adjusted for the appropriate type of material. The surface of the partial fill section upon which fill is to be placed shall then be compacted as hereinafter specified for the appropriate type of fill. No separate payment will be made for loosening and rolling the foundation area, the abutment area, or the surfaces of partial fill sections, but the entire cost thereof shall be included in the applicable contract price for fill.

5.2 Bedrock. During and following foundation drilling and grouting, and also prior to the placement of materials upon or against a rock surface within the dam, dike and spillway structures, the rock surface shall be prepared and treated as specified below. This preparation shall be coordinated with the requirements for area preparation specified in section: DRILLING AND GROUTING.

5.2.1 Preparation. All bedrock surfaces shall be cleaned by air blasting and hand picking of all loose rock fragments, sand, gravel, and other objectionable material as directed. Sluicing is not acceptable. The surface shall be given a thorough cleaning for foundation grouting and surface treatment operations and a final clean-up to remove any unsuitable materials immediately prior to placement of the fill. All water shall be removed from depressions and the surface moistened as directed.

5.2.2 Surface Treatment. Areas of the bedrock surface underlying the embankment shall be treated with grout slurry or dental concrete as directed by the Contracting Officer. No grout slurry or dental concrete shall be placed until the foundation cleanup is approved. Grout slurry shall be used to fill all open cracks, crevices, and small pockets to the depths cleaned. In no case shall a thin coat of mortar be left on smooth, intact rock surfaces. Grout slurry shall be

composed of variable mixes of cement, water and sand. The moisture content of the foundation at the time of slurry, treatment shall be such as to prevent absorption of moisture from the slurry, but no free standing water shall exist. Dental concrete shall be used to fill larger pockets, scour channels and other conditions resulting from dental excavation. The base of rock overhangs and protrusions not removed by scaling shall be filled with concrete to form a fillet so that satisfactory compaction of embankment materials can be accomplished. Vertical surfaces shall not be more than 5 feet in height, and benches of sufficient width shall be provided as necessary so that the average slope of any rock face is not steeper than 2 vertical on 1 horizontal. Grout slurry and concrete shall conform with the applicable provisions of section: CONCRETE CONSTRUCTION.

6. PLACEMENT.

6.1 General. No fill shall be placed on any part of the embankment foundation until all slurry grout and dental concrete has set and the areas have been inspected and approved. The gradation and distribution of materials throughout the compacted fill sections shall be such that the embankment will be free from lenses, pockets, streaks, and layers of material differing substantially in texture or gradation from surrounding material of the same class. Successive loads of material shall be dumped at locations on the fill as directed or approved by the Contracting Officer. No fill shall be placed upon a frozen surface, nor shall snow, ice, or frozen earth be incorporated in the embankment. During the course of construction, embankment fills will be continuously inspected and tested by the Government for density and moisture. The Contractor shall vary his operations to permit testing when directed.

6.2 Rate of Placement. Unless otherwise directed, the entire embankment shall be maintained at approximately the same level regardless of the number of types of materials being placed except, that stone facing and filter material shall be placed with sufficient lag to prevent mixture of embankment and stone or filter materials.

6.3 Zone I (Impervious Fill). In general, the more impervious materials shall be placed towards the center of the impervious section and the coarser materials toward the Zone II sections so that a transition in gradation is effected.

6.4 Zone II (Random or Transition Fill). In general, the more impervious of the Zone II material shall be placed toward the impervious Zone I section and the more pervious of the Zone II material shall be placed towards the outer edge of the Zone II section so that a transition in gradation is effected from the Zone I section to the Zone III fill section.

6.5 Zone III (Pervious Fill). In general, the Zone III fill sections of embankment shall be placed with the less pervious material near the Zone II sections of the embankment and the more pervious materials near the outer slopes of the embankment.

6.6 Filter Material. Filter material shall be placed on the embankment in the manner herein described and to the lines and grades indicated on the plans. Tolerance of plus or minus one inch will be allowed.

6.7 Spreading. After dumping, the materials shall be spread by bulldozers or other approved means in approximately horizontal layers over the entire fill areas. Unless otherwise directed, the thickness of these layers before compaction with rubber-tired rollers shall not be more than 12 inches for Zone I and Zone II materials nor more than 24 inches for Zone III materials, except backfill which shall be spread as specified hereinafter. As soon as practicable after commencement of construction of any section of the embankment, the central portion thereof shall be raised or crowned with grades not to exceed 4 percent so that the surface of the fill will drain freely and shall be so maintained throughout construction. To prevent smoothness detrimental to proper bond, each layer of Zone I material shall be scarified, by approved methods, before the succeeding layer is placed thereon. If the compacted surface of any layer of Zone II or Zone III material, exclusive of filter material, is determined to be too smooth to bond properly with the succeeding layers, it shall be loosened by harrowing, or by any other approved method, before the succeeding layer is placed thereon. During the dumping and spreading processes, the Contractor shall maintain at all times a force of men adequate to remove all roots and debris from all embankment materials and all stones of greater than 6 inches in maximum dimension for Zones I and II and 18 inches for Zone III. Stone so removed shall be placed in the outer slopes of the fill and the roots and debris shall be removed from the embankment and disposed of in an approved manner. The entire surface of any section of the embankment under construction shall be maintained in such condition that construction equipment can travel on any part of any one section. Ruts in the surface of any layer shall be filled satisfactorily before compaction.

7. MOISTURE CONTROL.

7.1 General. The Contractor shall add moisture to the materials in the borrow areas as described in section: EXCAVATION. A water distribution truck shall be used at all times on the grade to preclude moisture loss, facilitate compaction and improve trafficability. The materials in each layer of the fill shall contain the amount of moisture, within the limits specified below or as directed by the Contracting Officer, necessary to obtain the desired compaction as determined by the Contracting Officer. Material that is not within the specified limits after compaction shall be reworked, regardless of density.

7.2 Zone I Fill Section. The materials shall be wetted at the source. The moisture content after compaction shall be as uniform as practicable throughout any one layer of impervious materials. The moisture content after compaction shall be within the limits of 2 percentage points above optimum and 2 percentage points below optimum as determined by the Contracting Officer. Material that is too wet shall be spread on the embankment and permitted to dry, assisted by discing or harrowing, if necessary, until the moisture content is reduced to an amount within the specified limits. When

the material is too dry, the Contractor will be required to sprinkle each layer on the fill and by use of a "Pulvi-mixer" or similar machine approved by the Contracting Officer, will be required to work the moisture into the material until a uniform distribution of moisture is obtained. Water applied on a layer of fill shall be accurately controlled in amount so that free water will not appear on the surface during or subsequent to rolling. Should too much water be added to any part of the embankment, so that the material is too wet to obtain the desired compaction, the rolling on that section of the embankment shall be delayed until the moisture content of the material is reduced to an amount within the specified limits. If, in the opinion of the Contracting Officer, the top or contact surfaces of a partial fill section become too dry to permit suitable bond between these surfaces and the additional fill to be placed thereon, the Contractor shall loosen the dried materials by scarifying or discing to such depths as may be directed by the Contracting Officer, shall dampen the loosened material to an acceptable moisture content, and shall recompact this to densities comparable to the underlying embankment. If, in the opinion of the Contracting Officer, the top or contact surfaces of a partial fill section become too wet to permit suitable bond between these surfaces and the additional fill to be placed thereon, the wet material shall be scarified and permitted to dry, assisted by discing or harrowing, if necessary, to such depths as may be directed by the Contracting Officer. The material shall be dried to an acceptable moisture content and recompacted in accordance with the applicable requirements specified hereinafter to densities comparable to the underlying embankment.

7.3 Zone II Fill Section. The upper and lower limits of moisture content, and the moisture control procedures for Zone II materials shall be the same as that specified for Zone I material.

7.4 Zone III Fill Sections. No limits will be placed on the moisture content of Zone III material. Zone III material placed along the abutments shall be saturated prior to compaction.

7.5 Filters. Moisture control of filters will not be required and sluicing will not be permitted.

8. COMPACTION.

8.1 Equipment. Compaction equipment shall conform to the following requirements and shall be used as prescribed in subsequent paragraphs.

8.1.1 Rubber-Tired Rollers. Rubber-tired rollers shall have a minimum of four wheels equipped with pneumatic tires. The tires shall be of such size and ply as can be maintained at tire pressures between 80 and 100 pounds per square inch for a 25,000 pound wheel load during rolling operations. The roller wheels shall be located abreast and be so designed that each wheel will carry approximately equal load in 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 the tire width of a single tire at the operating pressure for a 25,000 pound wheel load. The roller shall be provided with a body suitable for ballast loading such that the load per wheel may be varied, as directed by the Contracting Officer, from 18,000 to 25,000 pounds. The roller shall be towed at speeds not to exceed five miles per hour. The character and efficiency of this equipment shall be subject to the approval of the Contracting Officer. The Contractor shall provide scales and pressure gages to check the rubber-tired rollers.

8.1.2 Power Tampers. Compaction of material, in areas where it is impracticable to use a roller or tractor, shall be performed by the use of approved power tampers.

8.2 Zone I, Zone II and Zone III Fill. After a layer of Zone I, Zone II and Zone III fill material has been dumped and spread, it shall be harrowed if required, to break up and blend the fill materials, unless harrowing is performed to obtain uniform moisture distribution. Harrowing shall be performed with a heavy disk plow, or other approved harrow, to the full depth of the layer. If one pass of the harrow does not accomplish the breaking up and blending of the materials, additional passes of the harrow may be required, but in no case will more than three passes of the harrow on any one layer be required for this purpose. When the moisture content and the condition of the layer is satisfactory, the lift shall be compacted by not less than 6 complete passes for Zone I, 8 complete passes for Zone II and 8 complete passes for Zone III of the 50 ton rubber-tired roller. A complete pass shall consist of one movement of the specified equipment over the area to be compacted. The equipment shall be operated so that the strip being traversed by the roller shall overlap the rolled adjacent strip not less than one foot. Overlapping of previously rolled areas by one foot will not be considered as an extra pass over the fill area overlapped. Rollers will not be permitted to operate within 2 feet of structure walls and the outlet conduit until the compacted fill over the top of the structures has reached a depth of 2 feet. Compaction equipment shall be so operated that structures are not damaged nor overstressed during rolling operations. If it is determined that the desired compaction of any fill is not secured by the minimum number of passes specified, additional passes shall be made over the surface area of such designated portions. This procedure shall be repeated until the desired compaction is obtained. The Contractor shall have additional rolling time certified at the time of performance. Portions of the fill which are not accessible to the roller shall be placed in 6-inch layers loose measurement and compacted with power tampers to a degree equal to that obtained on the other portions of the compacted fill by rolling as specified. Dumping, spreading, sprinkling, and compacting may be performed at the same time at different points along a section when there is sufficient area to permit these operations to proceed simultaneously. When, in the prosecution of the work, excavation precedes fill to such an extent that the materials excavated cannot be placed directly in the embankment, such materials shall be stockpiled at approved locations adjacent to the work until their use is authorized. No additional payment will be made for such stockpiling nor for the reloading and hauling of this material to its final position.

9. MISCELLANEOUS FILL. Material from required excavation shall be placed in the miscellaneous fill areas indicated on the drawings or otherwise directed. The fill shall be dumped and spread in horizontal layers not to exceed 12 inches in thickness. Compaction other than that obtained by the controlled movement of the hauling and spreading equipment over the area will not be required.

10. BACKFILL.

10.1 General. No backfill or other load shall be placed on or against concrete surfaces before expiration of the minimum period after placing the concrete as indicated below:

Walls and vertical faces 14 days

Conduit 14 days

Before passage of hauling and rolling equipment over the top of the conduit or other structures will be permitted, the depth of fill over the concrete shall be sufficient to permit such passage without inducing harmful stresses or vibrations in the structure.

10.2 Placement. Backfill shall be placed in 6-inch layers and thoroughly compacted. Unless otherwise directed, the placing and compaction of all backfill material and the control of its moisture content shall conform to the applicable provisions specified hereinbefore. Rollers will not be permitted to operate within 2 feet of structure walls, conduit sides, or conduit top. Within this restricted area, and other areas where rollers cannot be used, the material shall be compacted by means of power tampers. Fill in back of walls shall be kept at approximately the same elevations as that of the backfill, or stone on the opposite side of the wall until placement has reached the maximum elevation of the materials to be placed on the toe of the wall. Drainage openings through walls shall be kept open at all times.

11. SLIDES. In the event of slides in any part of the embankment prior to final acceptance of the work the Contractor shall remove material from the slide area, as directed, and shall rebuild such portion of the embankment. In case it is determined that the slide was caused through fault or negligence of the Contractor the removal and disposal of material and the rebuilding of the embankment shall be performed without cost to the Government.

* * * * *

SECTION 4A

CONCRETE CONSTRUCTION

Index

1. Applicable Publications
2. Composition
3. Quality
4. Cement
5. Admixtures
6. Aggregates
7. Epoxy-Resin Grout
7A Abrasive Aggregate
8. Water
9. Proportioning of Concrete
10. Batching and Mixing
11. Conveying
12. Placing
13. Construction Joint Treatment
14. Expansion, Contraction and Vertical Construction Joints
15. Finishing
16. Curing and Protection
17. Forms and Formed Surfaces
18. Furnishing and Placing Steel Reinforcement
19. Formed Holes
20. Embedded Items
20A Grout Slurry Mix
21. Appearance
22. Contractor Quality Control

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 Federal Specifications (Fed. Spec.)

SS-C-1960/3	Cement, Portland
SS-A-701B	Asphalt, Petroleum (Primer, Roofing, and Waterproofing)
SS-C-153c	Cement, Bituminous, Plastic
TT-S-00227E [COM-NBS] & Am-3	Sealing Compound; Elastomeric Type, Multi-Component (for Calking, Sealing, and Glazing in Building, and Other Structures)
MMM-G-650B	Grout, Adhesive, Epoxy Resin, Flexible, Filled

1.2 U. S. Army, Corps of Engineers, Handbook for Concrete and Cement (CRD)

CRD-C 13-66	Air-Entraining Admixture for Concrete by the Pressure Method
CRD-C 55-73	Concrete Mixer Performance
CRD-C 100-75	Concrete Aggregate and Aggregate Sources, and Selection of Material for Testing
CRD-C 112-69	Surface Moisture in Aggregate by Water Displacement
CRD-C 119-53 Rev. June 1963	Flat and Elongated Particles in Coarse Aggregate
CRD-C 300-72	Specifications for Membrane-Forming Compounds for Curing Concrete
CRD-C 400-63	Water for Use in Mixing or Curing Concrete
CRD-C 513-74	Rubber Waterstops
CRD-C 572-74	Polyvinylchloride Waterstop

1.3 National Bureau of Standards (NBS) Handbook

H44	Specifications, Tolerances and Other Technical Requirements for Commercial Weighing and Measuring Devices (4th Edition, 1971 with Replacement Sheets 1972, 1973, 1974, 1975)

1.4 American Concrete Institute (ACI) Standards

ACI 315-74	Manual of Standard Practice for Detailing Reinforced Concrete Structures (6th Edition, 2nd printing, Apr 1975)
ACI 318-71	Building Code Requirements for Reinforced Concrete with Commentary and 1975 Suppl

1.5 merican Society for Testing and Materials (ASTM) Standards

A 185-73	Welded Steel Wire Fabric for Concrete Reinforcement
A 615-75	Deformed and Plain Billet - Steel Bars for Concrete Reinforcement
C 70-73	Surface Moisture in Fine Aggregate
C 94-74a	Ready-Mixed Concrete
C 117-69 (R1974)	Materials Finer than No. 200 (75-m) Sieve in Mineral Aggregates by Washing
C 135-66 (R 1971)	True Specific Gravity for Refractory Materials by Water Immersion
C 136-71	Sieve or Screen Analysis of Fine and Coarse Aggregates
C 143-74	Slump of Portland Cement Concrete
C174-49 (R 1975)	Measuring Length of Drilled Concrete Cores
C 231-75	Air Content of Freshly Mixed Concrete by the Pressure Method
C 566-67 (R 1972)	Total Moisture Content of Aggregate by Drying
D1752-67 (R1973)	Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
E 11-70	Wire Cloth Sieves for Testing Procedures

1.6 Concrete Plant Manufacturers Bureau (CPMB)

March 1, 1973	Concrete Plant Standards (Fourth Revision)

1.7 American Welding Society (AWS) Standard.

D12.1-75	Reinforcing Steel Welding Code

2. COMPOSITION. Concrete shall be composed of a cementitious material, water, fine and coarse aggregates and admixtures. The cementitious materials shall be portland cement. The admixture shall be an air-entraining agent.

3. QUALITY. The concrete mixtures will be designed by the Contracting Officer.

4. CEMENT.

4.1 General. Cement shall be furnished in bulk except that cement necessary for finishing and patching may be packaged.

4.2 Portland Cement. Portland cement shall conform to Fed. Spec. SS-C-1960/3, Type I or II, Low alkali.

4.3 High-Early-Strength Portland Cement. High-early-strength portland cement shall conform to Fed. Spec. SS-C-1960/3, Type III, and shall be used only when specifically approved in writing. Concrete made with such cement shall be subject to all applicable provisions of these specifications.

4.4 Temperature of Cement. The temperature of the cement as delivered to storage at the site, shall not exceed 150 degrees F.

4.5 Test Requirements.

4.5.1 The Contractor shall arrange for the cement sampling, testing and reporting, and the cost thereof shall be included in the appropriate bid item for cement. Cement shall be sampled and tested at the mill by the cement manufacturer in accordance with the specifications. The manufacturer shall furnish a report of results of tests for each lot of cement offered for use under this contract, shall identify the test report with the particular lot of cement, and shall certify that the sampling and testing procedures conform with the requirements of the specifications. No cement shall be used until notice of acceptance has been given by the Contracting Officer. All cement will be subject to check testing from samples obtained at the mill, at transfer points, or at the project, as scheduled by the Contracting Officer, and such sampling and testing will be by, or under the supervision of, the Government and at its expense. Access shall be granted as required to inspect storage and to sample for check testing. Cement not meeting specifications shall be promptly removed from the site of the work. Cement which has not been used within six months after test will be retested at the expense of the Contractor when directed by the Contracting Officer and shall be rejected if the test results are not satisfactory.

4.6 Transportation of Bulk Cement. When bulk cement is not unloaded from primary carriers directly into weathertight hoppers at the batching plant, transportation from the railhead, mill, or intermediate storage to the batching plant shall be accomplished in adequately designed weathertight trucks, conveyors, or other means which will protect the cement completely from exposure to moisture.

4.7 Storage. Immediately upon receipt at the site of the work, cement shall be stored in a dry, weathertight and properly ventilated structure. All storage facilities shall be subject to approval and shall be such as to permit easy access for inspection and identification. Sufficient cement shall be in storage to complete any lift of concrete started. In order that cement may not become unduly aged after delivery, the Contractor shall use any cement which has been stored at the site for 60 days or more before using cement of lesser age.

4.8 Separation of Materials. Separate facilities shall be provided for unloading, transporting, storage, and handling each type of cement.

4.9 Source. The Contractor shall notify the Contracting Officer of the source or sources from which the cement will be obtained at least 60 days in advance of the time when concrete placing is expected to begin. If cement is to be obtained from more than one mill, the notification shall state the estimated amount of cement to be obtained from each mill and the proposed schedule of shipments.

5. ADMIXTURES.

5.1 Air-entraining Admixtures.

5.1.1 General. The air entraining admixture shall conform to CRD-C 13 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entraining admixture shall be in a solution of suitable viscosity for field use.

5.1.2 Tests. The Contractor shall notify the Contracting Officer of the source from which the admixture will be obtained at least 60 days in advance of the item when concrete placing is expected to begin. The Contractor shall provide satisfactory facilities for the ready procurement of adequate test samples. All sampling and testing of an admixture will be by and at the expense of the Government. An air-entraining admixture which has been in storage at the project site for longer than 6 months or which has been subjected to freezing will be retested at the expense of the Contractor when directed by the Contracting Officer and shall be rejected if test results are not satisfactory.

6. AGGREGATES.

6.1 Composition. Fine aggregate shall consist of natural sand, manufactured sand, or a combination of natural and manufactured sands. Coarse aggregate shall consist of gravel, crushed gravel, crushed stone, or a combination thereof.

6.2 Sources and Evaluation Testing. Aggregates shall be produced from the sources listed in the SPECIAL PROVISIONS or from another source when approved in accordance with the SPECIAL PROVISIONS and the technical provisions herein. If the Contractor proposes to furnish aggregates from a source not listed, the Government will make such tests and other investigations as necessary to determine whether or not aggregates meeting the requirements of this project can be produced from the proposed source. The tests to which the aggregate will be subjected may include specific gravity, absorption, Los Angeles abrasion, soundness in magnesium sulfate, petrographic analyses, freezing and thawing in concrete, alkali-aggregate reaction, organic impurities, and any other tests that are necessary to demonstrate that concrete of acceptable quality and cost can be produced from the materials proposed. These tests will be conducted in accordance with the applicable Corps of Engineers methods of those given in the Handbook for Concrete and Cement. When the Contractor desires to use aggregates from a source not listed suitable samples for quality evaluation consisting of not less than 300 pounds of each size coarse aggregate and 200 pounds of fine aggregate shall be taken under the supervision of the Contracting Officer in accordance with

CRD-C 100 and shall be delivered transportation prepaid to Division Laboratory, U. S. Army Engineer Division, South Pacific, Sausalito, California, within 15 days after date of notice to proceed. Sampling and shipping of samples shall be at the Contractor's expense. A maximum of 30 days will be required to complete evaluation of the aggregates.

6.3 Sample for Mixture Design Studies. At least 45 days in advance of the time when placing of concrete is expected to begin samples of representative materials proposed for this project shall be delivered transportation prepaid to Division Laboratory, U. S. Army Engineer Division, South Pacific, Sausalito, California by the Contractor at his expense. Samples of approved aggregates shall be taken under the supervision of the Contracting Officer in accordance with CRD-C 100 accompanied by test reports indicating conformance with grading requirements hereinafter specified. Samples of materials other than aggregates shall be representative of those proposed for the project and shall be submitted accompanied by manufacturer's test reports indicating compliance with applicable specified requirements. Quantities of materials required shall be as follows:

Material	Quantity
1-1/2" maximum size coarse aggregate	1,200 pounds
3/4" maximum size coarse aggregate	800 pounds
Fine Aggregate	1,000 pounds
Cement	500 pounds
Air-Entraining Admixture	1 quart

Mixture design studies will be made by the Government and at its expense. If concrete is to be placed by pumping, data shall be submitted on pumping equipment and samples submitted shall be capable of being proportioned to a pumpable concrete mixture.

6.4 Acceptance Sampling and Testing. During construction, aggregates will be sampled for acceptance testing as delivered to the mixer to determine compliance with specification provisions. The Contractor shall provide facilities and labor as may be necessary for the ready procurement of representative test samples. Samples from the weigh batcher will be obtained when directed by the Contracting Officer and under his supervision. The Government will test such samples at its expense using appropriate Corps of Engineers and ASTM test methods. Tests of aggregates at various stages in the process and handling operations will be made at the discretion of the Contracting Officer.

6.5 Quality. Aggregates, as delivered to the mixer, shall consist of clean, hard, and uncoated particles. Fines shall be removed from the coarse aggregates by adequate washing. The aggregate shall conform to the following specific requirements.

6.5.1 Grading.

6.5.1.1 Fine Aggregate. The grading and uniformity of the fine aggregate shall conform to the following requirements as delivered to the mixers:

Sieve Designation, U.S. Standard Square Mesh	Percentage by Weight Passing
3/8 in. (9.5 mm)	100
No. 4 (4.75 mm)	95-100
No. 8 (2.36 mm)	80-90
No. 16 (1.18 mm)	55-75
No. 30 (600 um)	30-60
No. 50 (300 um)	12-30
No. 100 (150 um)	2-10

In addition to the grading limits shown above, the fine aggregate, as delivered to the mixer shall have a fineness modulus of not less than 2.40 nor more then 3.10. The grading of the fine aggregate shall also be controlled so that the fineness moduli of at least four of any five consecutive test samples of the fine aggregate as delivered to the mixer shall not vary more than 0.15 from the average fineness modulus of all samples taken during the first 30 days of concrete placement unless otherwise directed. The fineness modulus shall be determined by dividing by 100, the sum of the cumulative percentages retained on U.S. Standard Sieves Nos. 4, 8, 16, 30, 50 and 100. At the option of the Contractor, fine aggregate may be separated into two or more sizes or classifications, but the uniformity of grading of the separate sizes shall be controlled so that they may be combined throughout the job in fixed proportions established during the first 30 days of concrete placement.

6.5.1.2 Coarse Aggregate. The grading of the coarse aggregate within the separated size groups shall conform to the following requirements as delivered to the mixer:

LIBRARY

Sieve Size U.S. Standard Square Mesh	Percent by Weight Passing Individual Sieves No. 4 to 3/4 In.	3/4 In. to 1-1/2 In.
2 in.	–	100
1-1/2 in.	–	90-100
1-in.	100	20-45
3/4 in.	90-100	0-10
3/8 in.	20-45	0-5
No. 4	0-5	

6.5.2 Particle Shape. The shape of the particles in the fine aggregate and in the coarse aggregate shall be generally spherical or cubical. The quantity of flat and elongated particles in the separated size groups of coarse aggregate, as defined and determined by CRD-C119, shall not exceed 25 percent in any size group.

6.6 Storage. Aggregates shall be stored in approved size groups adjacent to the batch plant in such manner as to prevent the inclusion of foreign materials in the concrete. Sufficient aggregate shall be maintained at the site at all times to permit continuous placement and completion of any lift of concrete started.

6.7 Moisture Control. All fine aggregate and the smallest size group of the coarse aggregate shall remain in free-draining storage at the site until a stable moisture content is obtained prior to use.

7. EPOXY-RESIN GROUT shall be a two-component material conforming to Fed. Spec. MMM-G-650, type I or II. Type I shall be used when pavement, materials, or atmospheric temperature is 70 degrees F. or above. Type II shall be used when pavement, material, or atmospheric temperature is below 70 degrees F. Epoxy-resin grout shall be stored in a windowless and weatherproof, but ventilated, insulated, noncombustible structure with provision nearby for conditioning the material to 70 to 85 degrees F. for a period of 48 hours prior to use. The ambient temperature in the storage area shall at no time be higher than 100 degrees F.

7A. ABRASIVE AGGREGATE shall consist of not less than 55 percent aluminum oxide or silicon-carbide abrasive ceramically bonded together to form a homogenous material sufficiently porous to provide a good bond with portland cement paste or shall be crushed, factory-graded emergy aggregate, cubical or polyhedral in form, consisting of not less than 45 percent aluminum oxide and not less than 25 percent ferric oxide. The aggregate shall not be affected by freezing, moisture, or cleaning compounds. The aggregate shall be well graded in size from particles retained on the No. 30 sieve to particles passing the No. 8 sieve designated by ASTM E11.

8. WATER. Water for washing aggregates and for mixing and curing concrete shall be fresh and free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances and shall comply with CRD-C 400.

9. PROPORTIONING OF CONCRETE.

9.1 Control. The proportions of all material entering into the concrete shall be as directed. The proportions will be changed as necessary. Adjustments shall be made to the batch weights of cement and water as necessary to maintain the water-cement ratio and the stipulated slump with approval of the Contracting Officer.

9.2 Cement Content. The cement content of the concrete for the various parts of the structure will range from an approximate minimum of 470 to an approximate maximum of 660 pounds per cubic yard. The cement content of the concrete for lump sum items will be 560 pounds per cubic yard. The cement content of the lean mix concrete and dental concrete will be 240 pounds per cubic yard.

9.3 Aggregate Content. The amount and maximum size of aggregate to be used in the various parts of the structure shall be as directed. In general, the maximum size of coarse aggregate to be used in the various parts of the work will be 1-1/2 inches.

9.4 Air Content. The air content by volume based on measurements made immediately after discharge from the mixer shall be determined by ASTM C 231. The total calculated air content of that portion containing no aggregate particles that would be retained on a 2-inch square mesh sieve shall be 5.0 plus or minus 1.5 percent except that when the maximum size coarse aggregate is 3/4 inch the air content shall be 6.0 plus or minus 1.5 percent.

9.5 Slump. For each portion of the work slump shall be stipulated by the Contracting Officer. The slump shall not depart by more than 1-1/2 inches from that stipulated.

10. BATCHING AND MIXING.

10.1 Capacity. The Contractor shall provide a batching plant and concrete mixing equipment having a capacity of at least 100 cubic yards per hour.

10.2 Batching Plant.

10.2.1 Location. The batching plant may be located "on site" or "off-site".

LIBRARY

10.2.2 Arrangement. Separate bins or compartments shall be provided for fine aggregate, for the different sizes of coarse aggregate and for bulk cements when used. The compartments shall be of ample size and so constructed that the materials will be maintained separated under all working conditions. Aggregates may be weighed cumulatively in one weigh batcher on one scale. Bulk cement shall be weighed either on a separate scale or cumulatively with the aggregate in a separate compartment attached to the aggregate weighing hopper. If cement is weighed on the same scale as the aggregates, the cement shall be weighed first and all hoppers shall be empty and the scale shall be in balance before the weighing is begun. Water may be measured by weight or by volume. If measured by weight it shall not be weighed cumulatively with any other ingredient. The plant shall be arranged so as to facilitate the inspection of all operations at all times. Suitable facilities shall be provided for readily obtaining representative samples of aggregate from each of the bins or compartment for test purposes. Delivery of materials from the batching equipment shall be within the following limits of accuracy:

Material	Percent
Cement	2
Water	2
Aggregate	3
Admixture	3

When materials are weighed cumulatively, each limit above applies to the total weight in the batcher after the material corresponding to that limit has been batched.

10.2.3 Water Batcher and Dispenser for Admixture. Equipment for batching water and admixtures shall be provided at the batching plant or included with the paving mixers or truck mixers as required for the type of plant used.

10.2.3.1 Water Batchers. A suitable water measuring device shall be provided which will be capable of measuring the mixing water within the specified requirements for each batch. The mechanism for delivering water to the mixers shall be such that leakage will not occur when the valves are closed. The filling and discharge valves for the water batcher shall be so interlocked that the discharge valve cannot be opened before the filling valve is fully closed.

10.2.3.2 Dispenser. An accurate mechanical device for measuring and dispensing each admixture shall be provided. Each device shall be capable of ready adjustment to permit varying the quantity of admixture to be batched. Each dispenser shall be interlocked with the batching and discharging operations of the water so that each admixture is separately batched and discharged automatically in a manner to obtain uniform distribution throughout the batch in the specified mixing period. When use of truck mixers makes this requirement impracticable, the admixture dispensers shall be interlocked with the sand batcher. Admixtures will not be combined prior to introduction into water or sand.

10.2.4 Scales. Adequate facilities shall be provided for the accurate measurement and control of each of the materials entering each batch of concrete. The accuracy of the weighing equipment shall conform to the applicable requirements of NBS 44 for such equipment. The Contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale or other measuring device. Periodic tests shall be made in the presence of a Government inspector in such a manner and at such intervals as may be directed. Upon completion of each check test and before further use, the Contractor shall make such adjustments, repairs or replacements as may be required to secure satisfactory performance. Each weighing unit shall include a visible springless dial, which shall indicate the scale load at all stages of the weighing operation, or shall include a beam scale with a beam balance indicator which will show the scale in balance at zero load and at any beam setting. The indicator shall have an over and under travel equal to at least 5% of the capacity of the beam. The weighing equipment shall be arranged so that the plant operator can conveniently observe all dials or indicators.

10.3 Concrete Mixers. Mixers may be stationary drum or vertical-shaft mixers, truck mixers, or paving mixers of approved design. The mixers shall have a rated capacity of at least 27 cubic feet of mixed concrete, and shall not be charged in excess of the capacity recommended by the manufacturer. Mixers shall be capable of combining the materials into a uniform mixture and of discharging this mixture without segregation. Each stationary and paving mixer shall be provided with an acceptable device to lock the discharge mechanism until the required mixing time has elapsed. The mixers shall be operated at the drum or blade speed designated by the manufacturer on the nameplate. The mixing periods specified herein are predicated on proper control of the speed of rotation of the mixer drum or mixing blades and on proper introduction of the materials into the mixer. The mixing time will be increased when such increase is necessary to secure the required uniformity of the concrete, or when tests of samples of concrete taken from the first, middle and last portions of the mixer discharge exceed any of the following uniformity requirements when tested in accordance with the provisions of CRD-C 55. When authorized, the mixing time may be reduced to the minimum time required to meet all the following requirements:

Test	Variability Index, Min.+
Water content of mortar, % by weight	91.5
Coarse aggregate content of concrete, % by weight	90.5
Unit weight of air-free mortar, 16/ft^3	98.5
Cement content of dried mortar, % by weight	82.5

+ Variability Index = $\frac{\text{Smallest Value}}{\text{Largest Value}} \times 100$

Uniformity tests will be made by the Government at its expense as frequently as necessary to determine that the mixing time in use on the project is adequate. When the Contractor proposes to reduce the mixing time, three uniformity tests at reduced mixing time will be made by the Government at the Contractor's expense to determine whether the reduced mixing time meets the requirements of these specifications. Excessive overmixing requiring additions of water will not be permitted. The mixers shall be maintained in satisfactory operating condition, and mixer drums shall be kept free of hardened concrete. Mixer blades shall be replaced when worn down more than 10 percent of their depth. Should any mixer at any time produce unsatisfactory results, its use shall be promptly discontinued until it is repaired. Suitable facilities shall be provided for obtaining representative samples of concrete for uniformity tests. All necessary platforms, tools, and equipment for obtaining samples shall be furnished by the Contractor.

10.3.1 Stationary Mixers. If no uniformity test data are available, the mixing time for each batch after all solid materials are in the mixer, provided that all of the mixing water is introduced before one-fourth of the mixing time has elapsed, shall be one minute for mixers having a capacity of one cubic yard; for mixers of larger capacities, the mixing time shall be increased 15 seconds for each additional cubic yard or fraction thereof of concrete mixed. When a stationary mixer is used for partial mixing of the concrete (shrink mixed) the mixing time in the stationary mixer may be reduced to the minimum necessary to intermingle the ingredients (about 30 seconds).

10.3.2 Truck Mixers. Truck mixers shall conform to the requirements of ASTM C 94, including requirements for uniformity of concrete. When a truck mixer is used either for complete mixing (transit-mixed) or to finish the partial mixing done in a stationary mixer, in the absence of uniformity test data, each batch or concrete shall be mixed not less than 70 nor more than 100 revolutions of the drum at the rate of rotation designated by the manufacturer of the equipment as mixing speed and at the capacity designated in ASTM C 94. If the batch is at least 1/2 cubic yard less than the rated capacity, in the absence of uniformity test data, the number of revolutions at mixing speed may be reduced to not less than 50. Any additional mixing shall be done at the speed designated by the manufacturer of the equipment as agitating speed. Each truck shall be equipped with two counters from which it shall be possible to determine the number of revolutions at mixing speed and the number of revolutions at agitating speed.

10.3.3 Paving Mixers. Paving mixers shall be used at the site of the work. For paving use, paving mixers shall be equipped with boom and bottom-dump bucket to handle the concrete from the mixer to the form. The bucket shall be of adequate size to handle the complete batch of concrete mixed, and the boom shall be of sufficient length to permit discharge of the concrete into its final position in the form. Paving mixers may be either single compartment drum or multiple compartment drum type. A sled or box of suitable size shall be attached to the mixer under the bucket so as to catch any spillage of concrete that may occur when the mixer is discharging concrete into the bucket. For use other than paving, the boom is not required; the mixer may discharge directly into the bucket to be used for final placement. Multiple compartment drum paving mixers shall be properly synchronized, and the mixing time shall be determined by including the time required to transfer the concrete between compartments of the drum. If no uniformity test data are available, the mixing time for each batch, after all solid materials are in the mixer drum, provided that all the mixing water is introduced, before one-fourth of the mixing time has elapsed, shall be 1 minute for mixers having a capacity of 1 cubic yard; for mixers of larger capacities, the minimum mixing times shall be increased 15 seconds for each additional cubic yard or fraction thereof of concrete mixed. Vehicles used in transporting materials from the batching plant to the mixers shall have bodies or compartments of adequate capacity to carry the materials and to deliver each batch, separated and intact, to the mixer. Except as otherwise approved by the Contracting Officer, loose cement shall be transported from the batching plant to the mixers in separate boxes or compartments which shall be equipped with wind-proof and rain-proof covers.

11. CONVEYING.

11.1 General. Concrete shall be conveyed from mixer to forms as rapidly as practicable, by methods which will prevent segregation or loss of ingredients. Any concrete transferred from one conveying device to another shall be passed through a hopper which is conical in shape and shall not be dropped vertically more than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Methods and equipment for handling and depositing the concrete in the form shall be subject to the approval of the Contracting Officer. Telephonic or other satisfactory means of rapid communication between the mixing plant and the forms in which concrete is being placed shall be provided and made available for use by the inspectors in the mixing plant and forms.

11.2 Buckets. Bottom-dump buckets shall have a capacity not exceeding 2 cubic yards and shall conform to the following requirements. The interior hopper slope shall be not less than 50 degrees from the horizontal, the minimum dimension of the clear gate opening shall be at least 5 times the maximum size aggregate or 12 inches, whichever is greater; and the area of the gate opening shall be not less than one square foot. The maximum dimension shall not be greater than twice the minimum dimension. The bucket gates shall be essentially grout tight when closed and may be manually, pneumatically or hydraulically operated. The design of the bucket shall provide means for positive regulation of the amount and rate of deposit of concrete in each dumping position.

11.3 Trucks. Truck mixers or agitators used for transporting central-mixed concrete shall conform to the applicable requirements of ASTM C 94. Non-agitating equipment may be used for transporting central mixed concrete over a smooth road when the hauling time is less than 15 minutes.

11.4 Chutes. When concrete can be placed directly from a truck mixer, agitator or non-agitating equipment the chutes attached to this equipment may be used. Separate chutes and other similar equipment will not be permitted for conveying concrete except when specifically approved.

11.5 Belt Conveyors. Belt conveyors may be used when approved. Such conveyors shall be designed and operated to assure a uniform flow of concrete from mixer to final place of deposit without segregation of ingredients or loss of mortar and shall have a speed of travel in excess of 500 feet per minute and be provided with positive means for preventing segregation of the concrete at the transfer points and the point of placing.

11.6 Pump Placement. Concrete may be conveyed by positive displacement pump when approved. The pumping equipment shall be piston or squeeze pressure type. The pipeline shall be rigid steel pipe or heavy duty flexible hose. The diameter of the pipe shall be at least three times the nominal maximum size coarse aggregate in the concrete mixture to be pumped. The maximum size coarse aggregate will not be reduced to accommodate the pumps. The distance to be pumped shall not exceed limits recommended by the pump manufacturer. The concrete shall be supplied to the concrete pump continuously. When pumping is completed, concrete remaining in the pipeline shall be ejected without contamination of concrete in place. After each operation, equipment shall be thoroughly cleaned, and flushing water shall be wasted outside of the forms.

12. PLACING.

12.1 General. Concrete shall be worked into the corners and angles of the forms and around all reinforcement and embedded items without permitting the material to segregate. Placing the concrete shall, so far as practicable, be done by bottom dump buckets conforming to requirements of paragraph: BUCKETS. Concrete shall be deposited as close as possible to its final position in the forms and in so depositing there shall be no vertical drop greater than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it may be effectively compacted in horizontal layers approximately 1-1/2 feet in thickness with a minimum of lateral movement. Not more than four cubic yards may be deposited in one pile for compaction in open,
unrestricted areas in the forms. In restricted areas such as around
embedded items deposit of less than 4 cubic yards in one pile will be required in most locations to insure that the concrete will be thoroughly and properly compacted. The amount deposited in each location shall be that which can be readily and thoroughly compacted. The surfaces of construction joints shall be kept continuously wet for the first twelve hours during the twenty-four hour period prior to placing concrete. Free water shall be removed prior to placement of mortar and additional concrete. All concrete placing equipment and methods shall be subject to approval. Concrete placement will not be permitted when, in the opinion of the Contracting Officer, weather conditions prevent proper placement and consolidation.

12.2 Time Interval Between Mixing and Placing. Concrete mixed in stationary mixers and transported by non-agitating equipment shall be placed within thirty minutes after it has been mixed, unless otherwise authorized. When concrete is truck mixed or when a truck mixer or agitator is used for transporting concrete mixed by stationary mixers, the concrete shall be delivered to the site of the work and discharge shall be completed within 1-1/2 hours after introduction of the cement to the aggregate except that when the temperature of the concrete exceeds 85 degrees F the time shall be reduced to 45 minutes. The concrete shall be placed within 15 minutes after it has been discharged.

12.3 Placing Temperatures.

12.3.1 Cold Weather. Concrete shall have a temperature of not more than 60 degrees F. and not less than 40 degrees F. when measured 20 minutes after mixing. Heating of the mixing water and/or aggregate will not be permitted until the temperature of the concrete has decreased to 45 degrees F. All methods and equipment shall be subject to approval.

12.3.2 Hot Weather. When local weather records show maximum daily temperature is likely to exceed 90 degrees F., the following precautions shall be taken in placing, curing, and protecting the concrete. The forms and subgrade, horizontal or sloped, shall be sprinkled with water immediately before placing the concrete. The concrete shall be placed at the coolest temperature practicable, and in no case shall the temperature of the concrete when deposited in the forms or on the subgrade exceed 90 degrees F. Control of the temperature of the concrete shall be by water spraying, or sprinkling of the coarse aggregate stockpiles and/or by placing water lines and water storage tanks below the ground surface. Refrigeration of aggregates and water or addition of ice to the water may be used. Methods will be approved in writing by the Contracting Officer.

12.4 Concrete on Earth Foundations. Earth foundations upon which concrete is to be placed shall be clean, damp, and free from frost, ice, and standing or running water. Prior to placing concrete the earth foundation shall have been satisfactorily compacted in accordance with the provisions of Section: FILLS AND SUBGRADE PREPARATION.

12.5 Lift in Concrete. The depth of concrete placed in each lift will be as shown on the drawings or specified herein. All concrete shall be deposited in approximately horizontal layers about 1-1/2 feet in thickness unless otherwise specifically authorized or directed. The placement shall be carried on at such a rate that the formation of cold joints will be prevented. Slabs (including starter walls) shall be placed in one lift unless otherwise authorized or directed. Other lifts shall terminate at such levels as will conform to architectural details.

12.6 Concrete on Rock Foundations. Rock surfaces upon which concrete is to be placed shall be clean, free from oil, standing or running water, ice, mud, drummy rock, coating, debris and loose, semi detached or unsound fragments. Faults or seams shall be cleaned to an approved depth and to firm rock on the sides. Immediately before concrete is placed, all rock surfaces shall be cleaned thoroughly by the use of high velocity air jets. All devices necessary to produce a foundation free of running or standing water shall be installed by the Contractor and securely fastened in place so as to prevent their being jarred loose by concrete placement. All rock surfaces shall be kept continuously wet for at least 24 hours immediately prior to placing concrete thereon.

12.7 Vibration of Concrete. Concrete shall be consolidated by mechanical vibrating equipment. Except where otherwise approved or directed, internal vibrators shall be used. Surface vibrators will not be used. Handspading may be required if necessary with internal vibration along formed surfaces permanently exposed to view. Where specifically approved or directed, form virbrators shall be used to supplement internal vibration. The vibrators selected for use shall have adequate air pressure available for air vibrators, and voltage for electric vibrators. An adequate number of vibrators shall be on hand to meet placing requirements, and spare vibrators shall be available to maintain production in the event of a breakdown. The head diameter, frequency (measured immersed), and average amplitude (measured in air) of the vibrators shall conform to the following requirements:

Application	Head Diameter (Inch)	Frequency VPM	Average Amplitude† (Inch)
Thin walls	1-1/4 - 2-1/2	9000 - 13500	0.02
Structural (3 inch slump or greater)	2 - 3-1/2	8000 - 12000	0.025
Mass and Structural (less than 3 inch slump)	3 - 6	7000 - 10500	0.03
Mass concrete	5 - 7	5500 - 8500	0.04

† The average amplitude of the vibrator shall be the average of two measurements, one taken near the tip and another taken near the back end of the head.

In no case shall vibrators be used to transport concrete within the forms. Vibration shall be systematic, with emphasis on closely spaced insertions. The duration shall be that necessary to produce good consolidation.

12.8 Placing Concrete Through Reinforcement. In placing concrete through reinforcement, care shall be taken that no segregation of the coarse aggregate occurs.

13. CONSTRUCTION JOINT TREATMENT.

13.1 General. As a lift is completed, the top surface shall be immediately and carefully protected from any condition that will damage the concrete.

13.2 Cleaning. Unformed concrete surfaces to which concrete is to be bonded shall be prepared for receiving the next lift by cleaning with either wet sandblasting, high pressure water jet, or air-water cutting; however, approved wet sandblasting equipment shall be provided. If the surface of a lift is congested with reinforcing steel, is relatively inaccessible, or, if for any other reason it is considered undesirable to disturb the surface of a lift before it has hardened, surface cutting by means of air-water jets will not be permitted and the use of wet sandblasting or high pressure water jet will be required.

13.2.1 Air-Water Cutting. Air-water cutting of a construction joint shall be performed at the proper time and only on horizontal construction joints. The surface shall be cut with an air-water jet to remove all laitance and to expose clean, sound aggregate, but not so as to undercut the edges of the larger particles of aggregate. The air pressure used in the jet shall be 100 psi plus or minus 10 psi and the water pressure shall be just sufficient to bring the water into effective influence of the air pressure. After cutting, the surface shall be washed and rinsed as long as

there is any trace of cloudiness of the wash water. The surface shall again be washed just prior to placing the succeeding lift. Where necessary to remove accumulated laitance, coatings, stains, debris, and other foreign material, wet sandblasting will be required as the last operation before placing the next lift.

13.2.2 High-Pressure Water Jet. A stream of water under a pressure of not less than 3000 psi may be used for cleaning. Its use shall be delayed until the concrete is sufficiently hard so that only the surface skin or mortar is removed and there is no undercutting of coarse aggregate particles. Where the cleaning occurs more than two days prior to placing the next lift or where the work in the area subsequent to the cleaning causes dirt or debris to be deposited on the surface, the surface shall be cleaned again as the last operation prior to placing the next lift. If the water jet is incapable of a satisfactory cleaning, the surface shall be cleaned by wet sandblasting.

13.2.3 Wet Sandblasting. When employed in the preparation of construction joints, wet sandblasting shall be performed as the final operation completed before placing and not more than two days prior to placing the following lift. The operation shall be continued until all accumulated laitance, coatings, stains, debris, and other foreign materials are removed. The surface of the concrete shall then be washed thoroughly to remove all loose material. The surface shall again be washed just prior to placing the succeeding lift.

13.2.4 Waste Disposal. The method used in disposing of waste water employed in cutting, washing and rinsing of concrete surfaces shall be such that the waste water does not stain, discolor, or affect exposed surfaces of the structures, or damage the environment of the project area. Methods of disposal shall be subject to approval.

14. EXPANSION, CONTRACTION AND VERTICAL CONSTRUCTION JOINTS.

14.1 General. Joint locations and details not shown on the drawings shall be as approved or directed. Construction joints shall be provided in the invert slab of open channel and side slopes whenever concrete pouring is stopped for period exceeding 45 minutes. Except for doweled joints, in no case shall any fixed metal, embedded in concrete, be continuous through an expansion or contraction joint.

14.2 Expansion and Contraction Joint Fillers. Expansion and contraction joint fillers shall be installed using material of the type and quality specified hereinafter.

14.2.1 Asphaltic Paint conforming to Fed. Spec. SS-A-701 shall be applied to concrete surfaces, by brushing, at the locations shown on the drawings.

14.2.2 Troweled Bituminous Joint Material shall be asbestos fibered bituminous cement conforming to Fed. Spec. SS-C-153, Type I and shall be troweled in place at least 24 hours prior to placing adjacent concrete.

14.2.3 Preformed Expansion Joint Filler shall conform to ASTM D 1752, Type I. The filler shall be securely held in position during concreting operations. Adjacent sections of filler shall be fitted tightly together to prevent entrance of concrete into the expansion space.

14.2.4 Joint Sealer shall conform to Fed. Spec. TT-S-227, Type I for horizontal joints and Type II for vertical joints, class A or B as applicable.

14.2.5 Expansion Joints with Joint Sealer. Premolded expansion-joint filler strips shall be installed at the proper level below the finished slab with a slightly tapered, dressed-and-oiled wood strip temporarily secured to the top thereof to form a groove not less than one inch deep. The wood strip shall be removed after the concrete has set. The groove, when surface dry, shall be cleaned of foreign matter, loose particles, and concrete protrusions, then filled approximately flush with joint sealer so as to be slightly concave after drying.

14.3 Waterstops. Waterstops of rubber or of polyvinylchloride (PVC) shall be installed in joints as shown on the drawings or as otherwise directed. The location, dimensions, and method of installation shall be as shown on the drawings. In order to eliminate faulty installation that may result in joint leakage, particular care shall be taken to see that the waterstops are correctly positioned during installation. All waterstops shall be installed so as to form a continuous watertight diaphragm in each joint. Adequate provision shall be made to support and completely protect the waterstops during the progress of the work. The Contractor shall replace or repair, at his expense, any waterstops punctured or otherwise damaged before final acceptance of the work. Maximum density and imperviousness of the concrete shall be insured by thorough working of the concrete in the vicinity of all waterstops. Suitable guards shall be provided to protect exposed projecting edges and ends of partially embedded waterstops from mechanical damage when concrete placement has been discontinued.

14.3.1 Type of Material. Waterstops may be rubber composed of natural rubber, a suitable synthetic rubber or a blend of natural and suitable synthetic rubber or of polyvinylchloride. Rubber waterstops shall conform to the requirements of CRD-C 513. Polyvinylchloride waterstops shall conform to the requirements of CRD-C 572.

14.3.2 Splices. All joints in the waterstop shall be spliced together to form a continuous watertight diaphragm in each joint. All splices shall be neat with the ends of the joined materials in true alignment. A temporary shop and bench shall be provided at the site of the installation and in every possible instance splices shall be made on the bench in the shop. All intersection splices shall be prefabricated at the manufacturer's plant or on the bench in the field shop. A miter box guide and portable power saw shall be provided and used to cut the ends to be joined to insure good alignment and contact between joined surfaces. The continuity of the characteristic members of the cross sections of the waterstop design shall be maintained across the splice.

14.3.2.1 Rubber. Splices in rubber waterstops shall be vulcanized in accordance with the manufacturer's recommendations.

14.3.2.2 Polyvinylchloride (PVC). Splices in PVC waterstops shall be made by heat sealing the adjacent surfaces in accordance with the manufacturer's recommendations. A thermostatically controlled electric source of heat shall be used to make all splices. The correct temperature at which splices should be made will differ with the material concerned but should be sufficient to melt but not char the plastic. After splicing, a remolding iron with ribs and corrugations to match the pattern of the waterstop shall be used to reform the ribs at the splice.

14.3.3 Testing. The Contractor shall submit samples of waterstops and samples of job-made and factory-made splices of waterstops for inspection and testing in accordance with CRD-C 513 and 572. The testing of the samples of waterstop and splices shall be performed by and at the expense of the Government. If a sample fails to meet the specifications requirements the waterstop or splicing method will be rejected and new samples shall be submitted for inspection and testing. The cost of retesting will be deducted from payments due the Contractor at the rate of $425.00 per waterstop sample retested and $250.00 per splice sample retested.

14.3.3.1 Samples of Waterstop Material. Each sample shall be a piece not less than 12 inches long cut from each 200 feet of finished waterstop furnished. Samples of waterstop furnished for inspection and testing shall include not less than a total of four lineal feet of each size and type furnished in each shipment to the job site. Each sample shall be identified to indicate the manufacturer, size, type of material, and quantity of material and shipment sample represents.

14.3.3.2 Samples of Job-Made and Factory-Made Splices. As a condition of approval of the proposed method of splicing the Contractor shall make 3 test splices in the presence of the Contracting Officer of the finished waterstops of each size and type of waterstop to be spliced in the factory and at the job site using the proposed method of splicing for inspection and testing. The sample splices shall be made using straight run pieces with the splice located at the mid-length of the sample and finished as required for the installed waterstop. The total length of each spliced sample shall be not less than 12 inches long. In addition to the foregoing test splices at least one test splice of each size and type, using the approved method, shall be furnished for inspection and testing for every 50 splices made in the factory and for every ten splices made at the job site.

15. FINISHING.

15.1 Formed Surfaces Except Woodgrain Finish. Immediately after removal of forms, all ridges or lips shall be removed and undesirable local bulging on the surfaces to be permanently exposed shall be remedied. Excessive rubbing of formed surfaces will not be permitted except as specified hereinafter for smooth finish. Voids and holes left by the removal of tie rods in all permanently exposed surfaces and surfaces to be exposed to water shall be reamed and completely filled with dry-patching mortar (preshrunk) mixed in the proportions directed. The cement used in the mortar for all surfaces permanently exposed to view shall be a blend of portland cement and white portland cement properly proportioned so that the final color of the cured mortar will be the same as the color of the surrounding concrete. The sand shall pass a No. 16 sieve. Defective concrete shall be repaired by cutting out the unsatisfactory material and placing new concrete which shall be secured with keys, dovetails or anchors. Concrete for patching shall be drier than the usual mixture and shall be thoroughly tamped into place. No patching will be done when either the concrete or ambient temperature is below 50 degrees F.

15.1.1 Smooth Finish. After the above operations have been completed, smooth finish shall be given to exterior concrete surfaces of the Intake Structure that are to be exposed to view. Smooth finish shall consist in thoroughly wetting and then brushcoating the surfaces with cement grout composed by volume of one part Portland cement to not more than 2 parts fine aggregate passing the No. 30 mesh sieve and mixed with water to the consistency of thick paint. White Portland cement shall be used for all or part of the cement, proportioned as determined by trial mixes, so that the final color of grout, when dry, will be approximately the same as the color of the surrounding concrete. Grout shall be cork- or wood-floated to fill all pits, air bubbles, and surface holes. Excess grout shall be scraped off with a trowel and the surface rubbed with burlap to remove any visible grout film. The grout shall be kept damp by means of fog spray during the setting period. The finish of any area shall be completed in the same day and the limits of a finished area shall be made at natural breaks in the finished surface.

15.1.2 Woodgrain Finish. Surface shall be left with the texture imparted by the forms except defective surfaces shall be repaired. The finish shall be applied to conform to the details indicated by use of approved textured form liners. Liner panels shall be secured in the forms by cementing or stapling, but not by methods which will permit impressions of nail heads, screw heads, washers or the like to be imparted to the surface of the concrete. Edges of textured panels shall be sealed to each other to prevent grout leakage. The sealant used shall be non-staining to the surface.

15.2 Unformed Surfaces. The ambient temperature of spaces adjacent to surfaces being finished shall be not less than 50 degrees F. All unformed surfaces of concrete that are not to be covered by additional concrete or backfill, shall have a wood float finish, unless a steel trowel finish is specified, and shall be true to elevation as shown in drawing. Surfaces to receive additional concrete or backfill shall be brought to the elevation shown on the drawings by screeding and left true and regular. Surfaces to receive a wood float finish shall be screeded and floated with straightedges to bring the surface to the required finish level with no coarse aggregate visible. No cement or mortar shall be added to the surface during the finishing operation. Floating may be performed by use of hand or power driven equipment. The concrete, while still green but sufficiently hardened to bear a man's weight without deep imprint, shall be wood-floated to a true even plane. A steel trowel finish shall be applied to the surfaces specified hereinafter.

Exterior surfaces shall be sloped for drainage unless otherwise shown on the drawings as directed. Joints shall be carefully made with a jointing tool. The finish surface shall be protected from stains or abrasions. Surfaces or edges likely to be injured during the construction peeriod shall be protected from damage.

15.2.1 Concrete Floor and Roof Slab Finishes. The ambient temperature of spaces being finished shall be not less than 50 degrees F. Finished floor and roof slab surfaces shall be true plane surfaces with no deviation in excess of 1/8 inch when tested with a 10-foot straightedge. Surface shall be pitched to drains. The dusting of finish surfaces with dry materials or additions of water to concrete surfaces will not be permitted. The concrete for floor and roof slabs shall be screeded and floated with straightedges to bring the surface to the required finish level with no coarse aggregate visible. The concrete, while still green but sufficiently hardened to bear a man's weight without deep imprint, shall be wood-floated to a true, even plane. After the surface moisture has disappeared, the surfaces shall be troweled to the required finish with no coarse aggregate visible. Floor surface shall be steel-troweled to a smooth, even, dense finish free from blemishes including trowel marks. Roof surfaces shall be lightly steel troweled and left free of ridges and other projections.

15.2.2 Power-Machine Finish (Option). In lieu of hand finishing, an approved power finishing machine may be used in accordance with the directions of the machine manufacturer. The preparation of concrete surfaces for finishing by machine shall in general be as hereinbefore required for hand finishing. Finished surfaces shall be free of machine marks, ridges, or other blemish.

15.2.3 Nonslip Abrasive Aggregate Finish shall be given to concrete stair treads. The concrete shall be screeded and floated to the required finish level with no coarse aggregate visible. Abrasive aggregate shall be uniformly sprinkled over the floated surfaces at a rate of not less than 1/4 pound per square foot. The surface shall be steel-troweled to a smooth, even finish that is uniform in texture and appearance and free from blemishes including trowel marks. Immediately after curing, cement coating or laitance covering the abrasive aggregate shall be removed by steel brushing, rubbing with an abrasive stone, or sandblasting to expose the abrasive particles.

16. CURING AND PROTECTION.

16.1 General. All concrete shall be cured for the period of time given below corresponding to the cementing materials used in the concrete.

Type III portland cement	3 days
Type I portland cement	7 days
Type II portland cement	14 days

The Contractor shall have all equipment needed for adequate curing and protection of the concrete on hand and ready to install before actual concrete placement begins. The curing medium and method, or the combination of mediums and methods used, shall be approved in writing. The curing medium shall be applied so as to prevent loss of moisture from the concrete. Concrete shall be protected from the damaging effects of rain for 12 hours, flowing water for 14 days and direct rays of the sun for 3 days. All concrete shall be adequately protected from damage. No fire or excessive heat shall be permitted near or in direct contact with concrete at any time. Formed openings through the concrete shall be closed during the entire construction period.

16.2 Moist Curing. Concrete shall be moist-cured by maintaining all surfaces continuously (not periodically) wet for the duration of the entire curing period. Water for curing shall comply with the requirements of paragraph: WATER. If water is used which stains or discolors concrete surfaces which are to be permanently exposed, they shall be cleaned as required in paragraph: APPEARANCE. Where forms of tongue-and-groove or shiplap sheathing are left in place during curing, the sheathing shall be kept wet at all times. Horizontal surfaces shall be cured by ponding, by covering with a minimum uniform thickness of 2 inches continuously saturated sand, or by covering with saturated non-staining burlap or cotton mats.

16.3 Membrane Curing. Concrete may be cured with an approved curing compound in lieu of moist curing. Membrane curing will not be permitted on surfaces to receive a smooth finish, on any surface to which concrete is to be bonded, cut-off walls, floor and roof slabs, surfaces to receive a floor hardener, and surfaces to receive joint materials.

16.3.1 The curing compound shall be a pigmented type conforming to CRD-C 300.

16.3.2 The Contractor shall notify the Contracting Officer of the source from which the curing compound will be obtained at least 45 days in advance of the time which concrete placing is expected to begin. The Contractor shall provide satisfactory facilities for ready procurement of adequate test samples. The sampling and testing will be by and at the expense of the Government.

16.3.3 The curing compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment except the cleaning of loose sand, mortar, and debris from the surface. The surfaces shall be thoroughly moistened with water and the curing compound applied as soon as free water disappears. The curing compound shall be applied to unformed surfaces as soon as free water has disappeared. The curing compound shall be applied by approved power spraying equipment with an overlapping coverage that will give a two-coat application at a coverage of not more than 400 square feet per gallon for each coat. The application of curing compound by hand-operated pressure sprayers will be permitted only on odd widths or shapes of slabs, and on concrete surfaces exposed by the removal of forms. When application is made by hand-operated sprayers, the second coat shall be applied in a direction approximately at right angles to the direction of the first coat. The compound shall form a uniform, continuous, cohesive film that will not check, crack, or peel, and that will be free from pinholes and other discontinuities. If pinholes, abrasions, or other discontinuities exist, an additional coat shall be applied to the affected areas within 30 minutes. Concrete surfaces which have been subjected to rainfall within 3 hours after curing compound has been applied shall be adequately protected for the duration of the entire curing period from pedestrian and vehicular traffic and from any other cause which will disrupt the continuity of the curing membrane.

16.4 Cold Weather. The air and forms in contact with concrete sections have a minimum dimension less than 12 inches shall be maintained at a temperature above 50 degrees F for at least the first 3 days and at a temperature above 32 degrees F for the remainder of the specified curing period. The air and forms in contact with concrete in more massive sections shall be maintained at a temperature above 40 degrees F for at least the first 3 days and at a temperature above 32 degrees F for the remainder of the specified curing period. In addition, during the period of protection and protection removal, the air temperature adjacent to the concrete surfaces shall be controlled so that concrete near the surface will not be subjected to a temperature differential of more than 25 degrees F as determined by observation of ambient and concrete temperatures indicated by suitable thermometers furnished by the Government as required and installed adjacent to the concrete surface and 2 inches inside the surface of the concrete. The installation of the thermometers shall be made by the Contractor at such locations as may be directed. Curing compounds shall not be used on concrete surfaces which are maintained at curing temperature by use of free steam.

17. FORMS AND FORMED SURFACES.

17.1 General. Forms shall be mortartight and shall be structurally adequate, propertly aligned and adequately supported to produce concrete surfaces meeting the surface requirements specified below under "Surface Finish Requirements" and conforming to the positions shown on the drawings within the tolerance specified below under "Construction Tolerances". That portion of the form in contact with the concrete shall not be a material which interferes with the setting of the concrete. Where forms for continuous surfaces are placed in successive units, care shall be taken to fit the forms over the completed surface so as to obtain accurate alignment of the surface and to prevent leakage of mortar. Responsibility for their adequacy shall rest with the Contractor; however, the type, shape, size, quality, and strength of all materials of which the forms are made shall be submitted for review. Bolts and rods used for internal ties shall be so arranged, that when the forms are removed, metal will be not less than 2 inches from any concrete surface. Wire ties will not be permitted where the concrete surface will be exposed to weathering and where discoloration will be objectionable. All forms shall be so constructed that they can be removed without damaging the concrete. All exposed joints, edges, and external corners shall be chamfered and dummy chamfers and false joints shall be used to provide a neat and uniform appearance, unless otherwise directed or indicated on the drawings. Chamfered joints shall not be permitted where earth or rockfill is placed in contact with concrete surfaces. Chamfered joints shall be terminated a sufficient distance outside the limits of the earth or rock fill so that the ends of the joints will be clearly visible.

17.2 Surface Finish Requirements. The class of finish required for the various surfaces of the structures shall be as hereinafter specified. Allowable irregularities are designed "abrupt" and "gradual" for purposed of providing tolerances. Offsets resulting from displaced, misplaced or mismatched forms, or sheathing, or by loose knots in sheathing, or other similar form defects, shall be considered "abrupt" irregularities. Irregularities resulting from warping, unplaneness and similar uniform variations from planeness, or true curvature, shall be considered "gradual" irregularities. "Gradual" irregularities will be checked for conformance with the prescribed tolerances by means of 5-foot templates composed of a straight edge for plane surfaces, or a "shaped" template for curved or warped surfaces. Where concrete surfaces are to be permanently exposed to view, joints in form panels shall be arranged to provide a pleasing appearance. The requirements for the classes of finish and for the types of form materials permitted for each class shall be as indicated below.

Class "A" Finish. This class of finish shall apply to the exterior walls of the intake structure, retaining wall, and recorder house. The sheathing shall be composed of well-matched, tight fitting tongue and groove lumber, plywood, or concrete form board. If necessary, the sheathing shall be sanded to remove imperfections and to provide a form surface which will produce a concrete surface meeting the following tolerances: "Abrupt" irregularities shall not exceed 1/8-inch. "Gradual" irregularities shall not exceed 1/4-inch in 5 feet determined in the specified manner.

Class "B" Finish. This class of finish shall apply to the interior walls of the intake structure and all formed surfaces of concrete that will be permanently exposed to view. The sheathing shall be composed to tongue and groove lumber, shiplap, plywood, concrete form board, or steel. Steel lining on wood sheathing will not be permitted. The sheathing shall provide a surface which will produce a concrete surface meeting the following tolerances: "Abrupt" irregularities shall not exceed 1/4-inch and "gradual" irregularities shall not exceed 1/2-inch in 5 feet determined in the specified manner.

Class "C" Finish. This class of finish shall apply to all formed surfaces of the conduit interior and all formed water passage surfaces of the intake structure and outlet works. The sheathing may be of either tongue and groove lumber, plywood, concrete form board, laminated (two course) wood sheathing, or steel. Wood sheathing for curved or warped surfaces shall be composed of splines of lumber which can be bent to the required shape without splitting or cracking to form a smooth tight form. Where necessary, laminated forms shall be sanded to meet required tolerance in surface irregulatiries and to obtain the required shape. The sheathing shall provide a surface which will produce a concrete surface meeting the following tolerances: "Abrupt" irregularities shall not exceed 1/4-inch for irregularities parallel to the direction of flow of water or 1/8-inch for irregularities not parallel to the direction of flow of water. "Gradual" irregularities shall not exceed 1/4-inch in 5 feet measured in the specified manner.

Class "D" Finish. This class of finish shall apply to all formed surfaces of concrete upon or against which concrete, stone veneer or earth will be placed. The sheathing may be of wood, or steel, or may be steel lined. "Gradual" and/or "abrupt" irregularities shall not exceed 1-inch.

Class "F" Finish. This class of finish shall apply to the permanent project sign. It shall be obtained by use of textured form liners conforming to the details shown on the drawings. These liners may be of formed plastic sheet, wood, sheet metal or other approved material.

17.3 Construction Tolerances. Variation in alignment, grade and dimensions of the structures from the established alignment, grade and dimensions shown on the drawings shall be within the tolerances specified in the following tables.

TABLE I

CONSTRUCTION TOLERANCES FOR INTAKE STRUCTURE, RETAINING WALL, ENERGY DISSIPATOR, RECORDER HOUSE, AND OVERLOOK STRUCTURE

(1)	Variation from the plumb:	
	a. In the lines and surfaces of columns, piers, walls and in arises	In 10 ft . . . . . 1/4 inch but not more than . . . . . 1 inch
	b. For exposed corner columns, control-joint grooves, and other conspicuous lines	In any bay or 20 feet maximum . . . . 1/4 inch In 40 feet or more . . . . . 1/2 inch
(2)	Variation from the level or from the grades indicated on the drawings:	
	a. In floors, ceilings, beam soffits, and in arises	In 10 feet . . . . . 1/4 inch In any bay or 20 feet maximum . . . . 3/8 inch In 40 feet or more . . . . . 3/4 inch
	b. For exposed lintels, sils and other conspicuous lines	In any bay or 20 feet maximum . . . . 1/4 inch In 40 feet or more . . . . . 1/2 inch
(3)	Variation of the linear building lines from established position in plan and related position of columns, walls, and partitions	. . . . . 1 inch
(4)	Variation in the sizes and locations of sleeves, floor openings, and wall openings	. . . . . 1/4 inch
(5)	Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls	Minus . . . . . 1/4 inch Plus . . . . . 1/2 inch
(6)	Footings:	
	a. Variation of dimensions in plan	Minus . . . . . 1/2 inch Plus . . . . . 2 inches
	b. Misplacement of eccentricity	2 percent of the footing width in the direction of misplacement but not more than . . . . . 2 inches
	c. Reduction in thickness	Minus . . . . . 5 percent of specified thickness
(7)	Variation in steps:	
	a. In a single step	Riser . . . . . 1/8 inch Thread . . . . . 1/4 inch
	b. In two consecutive steps	Riser . . . . . 1/16 inch Thread . . . . . 1/8 inch

TABLE II

CONSTRUCTION TOLERANCES FOR CONDUIT

(1)	Departure from established alignment or from established grade	Free-flow conduits . . . . . 1 inch High-velocity conduits . . . . . 1/2 inch
(2)	Variation in thickness, at any point	Conduits . . . . . minus 2-1/2 percent or 1/4 inch, whichever is greater Conduits . . . . . plus 5 percent or 1/2 inch, whichever is greater
(3)	Variation from inside dimensions	. . . . . 1/2 of 1 percent

TABLE III

BONSTRUCTION TOLERANCES FOR ALL OTHER CONCRETE STRUCTURES

(1)	All structures:		
	a.	Variation of the constructed linear outline from established position in plan	. . . . . 1 inch In buried construction and bulkhead faces. . . . . 2 inches
	b.	Variations of dimensions to individual structure features from established	. . . . . 1 inch In buried construction and bulkhead faces . . . . . 2 inches
(2)	a.	Variation from the plumb, from the specified batter, or from the curved surfaces of all structures, including the lines and surfaces of columns, walls, piers, buttresses, vertical joint grooves, and visible arises	In 10 feet . . . . . 1/2 inch In 20 feet . . . . . 3/4 inch In 40 feet or more . . . . . 1-1/4 inches In buried construction, twice the above amounts For watertight joints see (5) below
	b.	Variation from the level or from the grades indicated on the drawing in slabs, beams, soffits, lintels, sills, twice the horizontal joint grooves, and visible arises	In 10 feet . . . . . 1/4 inch In 30 feet or more . . . . . 1/2 inch In buried construction, twice the above amounts
(3)	a.	Variation in cross sectional dimensions of columns, beams, buttresses, piers, and similar members	Minus . . . . . 1/4 inch Plus . . . . . 1/2 inch
	b.	Variation in the thickness of slabs, walls, and similar members	Minus . . . . . 1/4 inch Plus . . . . . 1/2 inch
(4)	Footings for columns, piers, walls, buttresses, and similar members:		
	a.	Variation of dimension in plan	Minus . . . . . 1/2 inch Plus . . . . . 2 inches
	b.	Misplacement of eccentricity	2 percent of footing width in the direction of misplacement, but not more than . . . . . 2 inches
	c.	Reduction in thickness	5 percent of specified thickness

TABLE III (Continued)

(5) Sills, sidewalls against which miter gates are mounted, piers against which radial gates are mounted, and similar watertight joints:
Variation from the plumb and level. . . . . not greater than a rate of 1/8 inch in 10 feet

(6) Variation in the sizes and locations of sleeves, floor openings, and wall openings. . . . . .1/4 inch

(7) Variation in steps:

a. In a single step — Riser . . . . . .1/8 inch; Tread . . . . . .1/4 inch

b. In two consecutive steps — Riser . . . . . 1/16 inch; Tread . . . . . .1/8 inch

17.4 Coating. Forms for exposed or painted surfaces shall be coated with form oil or form-release agent before the form or reinforcement is placed in final position. The coating shall be a commercial formulation of satisfactory and proven performance that will not bond with stain or adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds. The coating shall be used as recommended in the manufacturer's printed or written instructions. Forms for unexposed surfaces may be wet with water in lieu of coating immediately before placing concrete, except that in cold weather with probable freezing temperatures coating shall be mandatory. Surplus coating on form surfaces and coating on reinforcing steel and construction joints shall be removed before placing concrete.

17.5 Removal. Forms shall not be removed without approval, and all removal shall be accomplished in a manner which will prevent injury to the concrete. Forms shall not be removed before the expiration of the minimum time indicated below, except as otherwide directed or specifically authorized.

	Concrete with Type I or II Portland Cement
Conduit roofs	144 hrs
Walls (lifts 15 ft. and under)	24 hrs
Walls (lifts over 15 ft.)	48 hrs
Conduit in open cut	72 hrs

When conditions on the work are such as to justify the requirement, forms will be required to remain in place for longer periods.

18. FURNISHING AND PLACING STEEL REINFORCEMENT.

18.1 General. The Contractor shall furnish, cut, bend and place all steel reinforcement including rods, fabric and structural shapes as indicated on the drawings or otherwise required. At the time of concrete placement, all reinforcement shall be free from loose flaky rust, scale (except tight mill scale), mud, oil, grease or other coating that might reduce the bond with the concrete. Unless otherwise indicated herein or on the drawings or approved by the Contracting Officer, furnishing and placing or reinforcement shall be in accordance with ACI 315 or ACI 318. Unless specifically indicated on the drawings arc-welding of crossing bars, ties, stirrups, spirals or any other reinforcement will not be permitted.

18.2 Shop Drawings. The Contractor shall prepare and submit for approval of the Contracting Officer complete shop drawings in accordance with these requirements and requirements given elsewhere in these specifications. The shop drawings shall include details of the bending and placing schedule of the steel reinforcement together with bar schedules indicating the quantity, size, dimensions, total length, unit weight, and total weight of the various bars required. Details of bar supports including types, sizes, and placing tables and sequence shall be submitted for approval.

18.3 Quality. The steel reinforcement shall be Grade 40 deformed billet steel bars conforming to the requirements of ASTM A 615, including the following exceptions:

(1) Tension test specimens will be the full section of the bar as rolled for all sizes;

(2) The bend test requirements shall be based upon 180 degree bends of full size bars, for all grades of steel. The bend diameters for bend tests shall be as indicated in the following table and shall be measured on the inside of the bars.

Bar Size No.	Maximum Diameter
3, 4, and 5	3-1/2 bar diameters
6, 7, and 8	5 bar diameters
9, 10, and 11 (Grade 40)	5 bar diameters

Welded steel sire fabric shall conform to the requirements of ASTM A 185. The Contractor will furnish results of all tension and bend tests performe.

18.4 Hooks and Bends. Steel reinforcement may be mill or field bent. All bars shall be bent cold unless otherwise authorized.d. No bars partially embedded in concrete shall be field bent unlesss indicated on the drawings or otherwise authorized. All hooks or bends shall be in accordance with ACI 318.

18.5 Placing Reinforcement.

18.5.1 General. Steel reinforcement shall be accurately located in the forms within the specified tolerances and adequately supported to prevent displacement during concrete placement.

18.5.2 Supports. Wire bar supports shall conform to ACI 315. Wire ties shall be 16-gage or heavier black annealed wire and shall have ends pointing away from the form. Bar supports for formed surfaces exposed to view or to be painted shall be plastic protected, stainless steel or precast concrete units. Precast concrete bar supports shall be wedge-shaped, not larger than 3-1/2 x 3-1/2 inches and of thickness equal to that indicated for concrete cover with an embedded hooked toe wire for anchorage. If formed surface is exposed to view the precast concrete bar support shall be the same texture and color as the finished surface.

18.5.3 Spacing of Bars. The bars shall be spaced as indicated on the drawings or as otherwise directed. The spacing between adjacent bars and the distance between layers may not vary from the indicated position by more than one bar diameter nor more than one inch.

18.5.4 Concrete Protection for Reinforcement. The minimum concrete cover to main reinforcement shall be as indicated on the drawings. The minimum cover may not vary more than the maximum variation indicated in Table II with all permissible variations increasing the minimum cover required with no reduction of minimum cover permitted.

TABLE IV

TOLERANCES FOR REINFORCING STEEL COVER

MINIMUM COVER	MAX. VARIATION
6"	1/2"
4"	3/8"
3"	3/8"
2"	3/8"
1-1/2"	1/4"
1"	1/8"
3/4"	1/8"

18.6 Welding Reinforcement. Welding of steel reinforcement will be permitted only where indicated on the drawings or otherwise directed. Welding shall be performed in accordance with AWS Standard D12.1.

18.7 Splicing. All splices in reinforcement shall be as shown on the drawings. Bars may be spliced at alternate or additional locations at no additional cost to the Government, subject to the approval of the Contracting Officer. Except as provided herein, all splicing shall be in accordance with ACI 318.

18.7.1 Lapped Splices. Lapped splices shall be used only for bars smaller than size No. 14. Bar laps may be placed in contact and securely tied or may be separated sufficiently to permit the embedment of the entire surface of each bar in concrete, but shall not be spaced transversely farther aprt than one-fifth the required length of lap nor 6 inches. Lengths of laps for bars or welded wire fabric shall conform to the requirements of ACI 318, except when otherwise shown on the drawings.

19. FORDED HOLES shall be formed as approved. Forms shall be removable. The formed holes shall be sealed to prevent the intrusion of concrete during concrete placement. Fence post holes shall conform to the requirements of the section: FENCING.

20. EMBEDDED ITEMS. Before placing concrete, care shall be taken to determine that all embedded items are firmly and securely fastened in place as indicated on the drawings, or required. Embedded items shall be free of oil and other foreign matter such as loose coatings of rust, paint, and scale. The embedding of wood in concrete will be permitted only when specifically authorized or directed. Any air or water lines or other materials embedded in structures, as authorized construction expedients shall conform to the above requirements and upon completion of their use shall be backfilled with concrete or mortar as directed.

20.1 Anchorage Items. Slots for anchoring masonry to concrete and mortar shall be of standard manufacture and of types required to engage with the anchors to be provided and installed therein under other sections of these specifications, and shall be subject to approval. Slots shall be dovetail-type, of not lighter than no. 24 gage zinc-coated steel, with filler that prevents concrete or water from entering and that can be easily removed or punctured for installing anchors. Dovetail slots shall be installed vertically in the concrete spaced not over 2 feet apart for anchoring stone facing. Adequate slots shall be provided for anchoring members at openings.

20A. GROUT SLURRY MIX. Grout slurry shall be composed of cement, sand and water mixed in the proportions as directed. The estimated proportions may vary between one part of cement by volume to a minimum of 3 parts sand by volume to a maximum of 6 parts sand by volume and water to produce a satisfactory mixture consistent with placing requirements for foundation surface treatment as determined by the Contracting Officer. Fine aggregate shall conform to the requirements specified hereinbefore for concrete.

21. APPEARANCE. Surfaces which are to be permanently exposed shall be cleaned if stained or otherwise discolored, by a method which does not harm the concrete and which is approved by the Contracting Officer.

22. CONTRACTOR QUALITY CONTROL.

22.1 General. The Contractor shall perform the inspection and tests described in paragraph, "Inspection Details and Frequency of Testing" and based upon the results of these inspections and tests he shall take the action required in paragraph, "Action Required". Reports shall be submitted as required in paragraphs, "Action Required" and "Reports".

22.2 Inspection Details and Frequency of Testing.

22.2.1 Fine Aggregate.

22.2.1.1 Grading. Once during each shift when the concrete plant is operating, there shall be one sieve analysis and fineness modulus determination in accordance with ASTM C 136 and C 135, respectively, for the fine aggregate or for each fine aggregate, if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits. After the first 30 days of concrete placement the results shall be recorded on a sheet on which is also shown the specification limits applicable to the project.

22.2.1.2 Fineness Modulus Control Chart. Results for fineness modulus shall be grouped in sets of three consecutive tests and the average and range of each group plotted on a control chart. The upper and lower control limits for average shall be drawn 0.10 units above and below the target fineness modulus, and the upper control limit for range shall be 0.28.

22.2.1.3 Moisture Content. There shall be when in the opinion of the Contracting Officer the electric moisture meter is not operating satisfactorily at least two pairs of tests for moisture content in accordance with either ASTM C 70, C 566, or CRD-C-112 during each 8-hour period of mixing plant operation. The time for the tests shall be selected randomly within the 8-hour period. An additional test shall be made whenever the slump is shown to be out of control or excessive variation in workability is reported by the placing foreman. When the electric moisture meter is operating satisfactorily, at least two direct measurements of moisture content shall be made per week to check the calibration of the meter. Variability within a one-hour or 8-hour period may be determined by meter readings.

22.2.2 Coarse Aggregate.

22.2.2.1 Grading. At least once during each shift in which concrete plant is operating there shall be a sieve analysis in accordance with ASTM C 136 for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control. However, the Contractor is responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the 5 most recent tests including the current test. The Contractor may adopt limits for control coarser than the specification limits for samples taken other than at the batch plant bins to allow for degradation during handling.

22.2.2.2 Moisture Content. A test for moisture content of each size of coarse aggregate shall be made at least once a shift. When two consecutive readings for smallest size coarse aggregate differ by more than 1.0 percent, frequency of testing shall be increased to that specified for fine aggregate.

22.2.2.3 Particle Shape. When, in the opinion of the Contracting Officer, a problem exists in connection with aggregate particle shape; tests shall be made in accordance with CRD-C 119. Testing frequency shall be not less than one per day.

22.2.2.4 Material Finer Than No. 200 Sieve. When in the opinion of the Contracting Officer, a problem exists in connection with the clealiness of aggregate, tests shall be made in accordance with ASTM C 117. Testing frequency shall be not less than one per day.

22.2.3 Deleted.

22.2.4 Batch-Plant Control. When the concrete plant is operating the measurement of all constituent materials including cement, each size of aggregate, water and admixtures shall be continuously controlled. The aggregate weights and amount of added water to compensate for free moisture in the aggregates shall be adjusted as necessary. The amount of air-entraining agent shall be adjusted to control air content within specified limits. A report shall be prepared indicating type and source of cement used, amount and source of admixtures used, aggregate source, the required aggregate and water weights per cubic yard, amount of water as free moisture in each size of aggregate, and the batched aggregate and water weights per cubic yard for each class of concrete batched during plant operation.

22.2.5 Concrete.

22.2.5.1 Air Content. At least two tests for air content shall be made on randomly selected batches of each class of concrete during each 8-hour period of concrete production. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or government inspector. Tests shall be made in accordance with ASTM C 231. The average of each set of two tests shall be plotted on a control chart on which the average is set at 5.0 percent and the upper and lower control limits at 6.0 and 4.0 percent respectively. The range shall be plotted on a control chart on which the upper control limit is 2.0 percent. For concrete having a maximum aggregate size of 3/4 inch, the average shall be set at 6.0 percent and the lower and upper control limits at 5.0 and 7.0 percent respectively.

22.2.5.2 Slump. At least two slump tests shall be made on randomly selected batches of each class of concrete during each 8-hour period of concrete production in accordance with ASTM C 143. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or government inspector. The average of each set of two tests shall be plotted on a control chart on which the average is that stipulated by the Contracting Officer and the upper and lower limits are set 1.0 inch above and below the average. The range shall be plotted on a control chart on which the upper control limit is 2.0 inches.

22.2.6 Preparation for Placing. Foundation or construction joints, forms and embedded items shall be inspected in sufficient time prior to each concrete placement by the Contractor in order to certify to the Contracting Officer it is ready to receive concrete. The results of each inspection shall be reported in writing.

22.2.7 Placing. The placing foreman shall supervise all placing operations, shall determine that the correct class of concrete or grout is placed in each location as directed by the Contracting Officer and shall be responsible for measuring and recording concrete temperatures, ambient temperature, weather conditions, time of placement, yardage placed, and method of placement.

22.2.8 Curing.

22.2.8.1 Moist Curing. At least once each shift an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded.

22.2.8.2 Curing Compound. No curing compound shall be applied until the Contractor's authorized representative has verified that the compound is properly mixed and ready for spraying. At the end of each operation he shall estimate the quantity of compound used and the area of concrete surface covered and compute the rate of coverage in square feet per gallon. He shall note whether coverage is uniform.

22.2.9 Protection. At least once each shift an inspection shall be made of all areas subject to cold weather protection. Deficiencies shall be noted. During removal of protection, measurement of concrete and ambient temperature shall be made at least hourly.

22.2.10 Mixer Performance. A complete mixer performance test of three batches of concrete shall be made on each mixer in accordance with CRD-C 55 at the start of concrete placing and once a year thereafter. Truck mixers shall be tested for mixer performance in accordance with ASTM C 94. Additional tests may be made at any time to support a Contractor's request for reduction of mixing time. Whenever mixer adjustments are necessary because of failure of a mixer to comply, the mixer shall be retested after adjustment. The abbreviated test may be used for this purpose. Abbreviated tests shall be run routinely on each mixer at least once every two months.

22.2.11 Tolerances in Slab Thickness. Invert and side slope pavement shall be of the thicknesses indicated, and any deficiencies in the thickness shall be within the tolerances specified hereinafter.

22.2.11.1 Thickness Determination. The thickness of the invert and side slope pavements will be determined by the Government on the basis of measurements made on cores drilled from selected points within 2 weeks of completion of concreting operation. Measurements of individual cores will be performed in accordance with ASTM C174. Drilling of cores and filling the holes shall be accomplished by the Contractor with at least one core drilled for each 2,500 square feet of pavement invert and side slope.

22.2.11.2 Permissible Deviation. Permissible deviation in concrete thickness will be up to but not including 1/4 inch.

22.3 Action Required.

22.3.1 Fine Aggregate.

22.3.1.1 Grading. When the amount retained on any sieve is outside the specification limits, the fine aggregate shall be resampled and retested. If there is another failure on the same sieve, the fact shall immediately be reported to the Contracting Officer. All such tests shall be included in the control charts. Whenever a point, either for average or range, is beyond one of the control limits the frequency of testing shall be doubled. If two consecutive points are beyond the control limits, the process shall be considered out of control. The Contracting Officer shall be notified, and immediate steps shall be taken to rectify the situation. After two consecutive points have fallen within the control limits, testing at the normal frequency may be resumed.

22.3.1.2 Moisture Content. Whenever the moisture content of the fine aggregate changes by 0.5 percent or more, the scale settings for the fine aggregate batcher and water batcher shall be adjusted directly or by means of a moisture compensation device. If, at any time, the requirements for moisture variation are not met, the Contracting Officer shall be notified and immediate steps shall be taken to reduce the variation.

22.3.2 Coarse Aggregate.

22.3.2.1 Grading. When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be resampled and retested. If the second sample fails on the same sieve, that fact shall be reported to the Contracting Officer. Where two consecutive averages of 5 tests (or two consecutive tests where large samples are used) are outside of specification limits, that fact shall be reported to the Contracting Officer and immediate steps shall be taken to correct the grading.

22.3.2.2 Moisture Content. Whenever the moisture content of the smallest size of coarse aggregate changes by 0.5 percent or more, the scale settings for the aggregate batcher and water batcher shall be adjusted directly or by means of a moisture compensation device. If, at any time, the requirements for moisture variation are not met, the Contracting Officer shall be notified and immediate steps shall be taken to reduce the variation.

22.3.2.3 Particle Shape. When testing for particle shape is required, two consecutive failures in the same sieve size shall be immediately reported to the Contracting Officer, who shall provide instructions as to the necessity for corrective action.

22.3.2.4 Material Finer Than No. 200 Sieve. When testing for material finer than the No. 200 sieve is required by the Contracting Officer, and the tests results exceed 1.0 percent, the Contracting Officer shall be notified and immediate steps, such as washing or other corrective actions, shall be initiated immediately.

22.3.3 Deleted.

22.3.4 Concrete.

22.3.4.1 Air Content. Whenever points on the control chart approach the upper or lower control limits an adjustment should be made in the amount of air-entraining admixture batched. If a single test result is outside the specification limit such adjustment is mandatory. As soon as practical after each adjustment another test shall be made to verify the correctness of the adjustment. Whenever a point falls above the upper control limit for range, the dispenser shall be calibrated to insure that it is operating correctly and with good reproducibility. Whenever two consecutive points either for average or range are outside the control limits, the Contracting Officer shall be notified. Whenever the air content departs from the specified range, the concrete shall not be delivered to the forms.

22.3.4.2 Slump. Whenever points on the control chart approach the upper or lower control limits an adjustment should be made in the batch weights of water and fine aggregate. When a single slump is outside the control limits such adjustment is mandatory. As soon as practical after each adjustment another test shall be made to verify the correctness of the adjustment. Whenever the slump departs from that stipulated by the Contracting Officer by more than 1-1/2 inches the concrete shall not be delivered to the forms. Whenever two consecutive slump tests, made during a period when there was no adjustment of batch weights, produce a point on the control chart for range above the upper control limit, the slump shall be considered to be out of control and the additional testing for aggregate moisture content required in paragraph "Moisture Content" shall be undertaken.

22.3.5 Placing. The placing foreman shall not permit placing to begin until he has verified that an adequate number of vibrators in working order and with competent operators are available. Placing shall not be continued if any pile is inadequately consolidated. If any batch of concrete fails to meet the temperature requirements, immediate steps shall be taken to improve temperature control.

22.3.6 Curing.

22.3.6.1 Moist Curing. When a daily inspection report lists an area of inadequate curing, the required curing period for that area shall be extended by one day.

22.3.6.2 Curing Compound. When the coverage rate of curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.

22.3.7 Protection. Whenever any concrete temperature during the period of protection or protection removal fails to comply with the specifications, that fact shall be reported to the Contracting Officer and immediate steps should be taken to correct the situation.

22.3.8 Mixer Performance. When a mixer fails to meet mixer performance requirements, either the mixing time shall be increased or adjustments shall be made to the mixer until compliance is achieved.

22.3.9 Concrete Deficient in Thickness. When measurement of any core indicates that the invert or side slope pavement is deficient in thickness 1/4 inch or more, additional cores shall be drilled at 25 foot intervals along the centerline of the lane on each side of the original deficient core, until the cores indicate that the deficiency in thickness is less than 1/4 inch. Pavement areas deficient in thickness 1/4 inch or more, but less than one inch may be overlaid and left in place provided the slab reinforcement is demonstrated to be in the proper position and subject to approval of the Contracting Officer. Pavement areas deficient in slab thickness 1/4 inch or more, but less than one-inch and having misplaced reinforcement and pavement areas deficient in slab thickness one inch or more shall be removed and replaced for the full width of the original slab. Both the section of the slab removed and the section remaining in place shall have a minimum length equal to the slab width.

22.3.9.1 Removal and Replacement of Defective Pavement Areas. Defective pavement areas shall be removed and replaced as specified herein with pavements of the thickness and quality required by these specifications. The defective pavement shall be carefully removed in such manner that the adjacent pavement will not be damaged. When a portion of a slab is to be replaced, a saw cut the full depth of the slab shall be made 24 bar diameters but not less than 2 feet inside the portion to be removed and the slab removed. After the portion of the slab is removed, a saw cut 2 inches deep shall be made along the joint line, (except where there is an existing joint), using care to avoid damage to the reinforcement, and the remaining portion of the defective slab shall be carefully chipped out to an essentially vertical face on the portion to remain leaving the reinforcement protecting. Following placement of reinforcement and prior to placement of the fresh concrete, the face of the slab shall be cleaned of debris and loose concrete and then thoroughly coated with epoxy-resin grout. The epoxy-resin coating shall be approximately 1/16 inch, and shall be applied by scrubbing a thin coat of grout into the surface with a stiff-bristle brush followed by a second application. Placement of the fresh portland-cement concrete shall be accomplished while the epoxy-resin is still tacky and in such manner that the grout coating will not be removed. The replaced pavements will be paid for at the contract price but no payment will be made for defective pavements removed nor for removing defective pavements.

22.3.9.2 Overlay Pavement. When approved by the Contracting Officer, pavement areas deficient 1/4 inch or more but less than one inch in thickness may be allowed to remain in place and be overlaid with 2 inches of new concrete as follows: The surface of the existing concrete shall be free of all greases, oils, laitance, curing compound, and debris. Curing compound shall be removed by sandblasting and the surface shall be thoroughly washed with a high-pressure water jet followed by an air jet to remove free water. The clean surface shall then be coated with a 20- to 40-mil- thick film of epoxy-resin grout. The epoxy-resin grout shall be placed in one application, just prior to concrete placement, with the use of mechanical combination mixing and spraying equipment, or shall be applied in two coats with stiff brushes. The first brush coat shall be scrubbed into the concrete surface followed by an additional brush coat to obtain the required thickness. When the brush method is used, the initial coat may be allowed to dry, however, the final coat shall be applied just prior to placement of concrete. Edges of the overlay pavement shall be notched into the underlying slab and the surface of the pavements finished flush. When tested with a 10 foot straight edge in the direction of flow deviation from the straight edge at the juncture shall not exceed 1/2 inch and there shall be no abrupt irregularities.

22.3.9.2.1 Epoxy-resin-grout components shall be mixed in the proportions recommended by the manufacturer. The components shall be kept at 70 to 80 degrees F. for 48 hours prior to mixing. The two epoxy components shall be mixed with a power-driven, explosion-proof stirring device in a metal or polyethylene container having a hemispherical bottom for the mixing vessel. The polysulfide curing-agent component shall be added gradually to the epoxy-resin component with constant stirring until a uniform mixture is obtained. The rate of stirring shall be such that the entrained air is a minimum.

22.3.9.2.2 Tools and equipment to be used further in the work shall be thoroughly cleaned before the epoxy-resin grout sets.

22.3.9.2.3 Time of placement of concrete overlay. The placement of the concrete shall be completed while the epoxy-resin grout is still tacky.

22.3.9.2.4 Health and Safety Precautions. Health and safety precautions shall conform to the applicable Federal, State and local regulations and to the following minimum precautions.

a. Full face shields shall be used during all mixing and blending operations and during placing operations as required.

b. Protective coveralls and neoprene-coated gloves shall be provided all workmen engaged in the operations.

c. Protective creams suitable for the operation shall be provided.

d. Adequate fire protection shall be maintained at all mixing and placing operations.

e. Smoking, and the use of spark- or flame-producing devices shall be prohibited within 50 feet of mixing and placing operations.

f. The mixing, placing, or storage of epoxy-resin grout or solvent shall be prohibited within 50 feet of any vehicle, equipment or machinery that could be damaged from fire or could ignite vapors from the material.

22.3.9.2.5 In event the overlay method of correcting pavement deficiencies is used, no additional compensation will be allowed therefor.

22.4 Reports. All results of tests conducted at the project site shall be reported weekly and shall be delivered to a designated representative of the Contracting Officer within 3 days after the end of each weekly reporting period. Each weekly report shall include the updating of control charts covering the entire period from the start of the construction season through the current week. During periods of cold weather protection, reports of pertinent temperatures shall be made daily. These requirements do not relieve the Contractor of the obligation to report certain failures immediately as required in preceding paragraphs. Such reports of failures and the action taken shall be confirmed in writing in the rountine reports. The Contracting Officer has the right to examine all Contractor quality control records.

* * * * *

SECTION 4 C

PRECAST-PRESTRESSED CONCRETE GIRDERS

Index

1. Applicable Publications
2. Shop Drawings
3. Materials
4. Formwork
5. Tensioning of Tendons
6. Precast-Prestressed Concrete Construction
7. Accuracy of Stress and Elongation Measurement
8. Inspection

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 American Society for Testing and Materials (ASTM) Publications.

A 416-74	Uncoated Seven-Wire Stress-Relieved Strand for Prestressed Concrete
C 138-75	Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
C 173-75	Air Content of Freshly Mixed Concrete by the Volumetric Method
C 231-75	Air Content for Freshly Mixed Concrete by the Pressure Method

1.2 American Concrete Institute Publication.

318-71	Building Code Requirements for Reinforced Concrete, With Commentary & 1975 Suppl.

2. SHOP DRAWINGS. Complete shop drawings for all prestressed concrete work shall be submitted to the Contracting Officer for approval in accordance with this paragraph, other paragraphs of the TECHNICAL PROVISIONS and the SPECIAL PROVISIONS. The shop drawings shall show complete details including formwork, inserts, reinforcing steel, size and type of tensioning elements and anchorages, sequence of stressing, method of curing, quality of concrete, erection details and methods, and complete stressing calculations. Prestressing shall be performed by the pretensioning method only.

3. MATERIALS.

3.1 Cement, Concrete and Reinforcing Steel. Cement, concrete, reinforcing steel, and admixtures shall conform to the applicable requirements of the section: CONCRETE CONSTRUCTION, except as otherwise specified herein. Reinforcing steel shall be Grade 60. Miscellaneous iron and steel shall conform to the applicable requirements of the section: MISCELLANEOUS METALWORK AND MATERIALS. The 28-day compressive strength for the prestressed components shall be as shown on the drawings. The Contractor shall be responsible for the design of concrete mixes and for meeting the strength requirements. However, the mixes and curing operation shall be submitted for approval. Neither calcium chloride nor any admixture containing any chloride shall be used in the concrete.

3.1.1 Air content of air-entrained concrete. The volume of entrained air in concrete shall be within the limits shown in the following table.

Maximum Size Coarse Aggregate Inches	Air Content by Volume
1-1/2, 2, or 2-1/2	5 plus or minus 1
3/4, 1	6 plus or minus 1
3/8, 1/2	7-1/2 plus or minus 1
1/4, or less	9-1/2 plus or minus 1

The air content shall be determined by one of the following methods.

a. The gravemetric method, ASTM C 138.

b. The volumetric method, ASTM C 173.

c. The pressure method, ASTM C 231.

3.2 Prestressing Steels. Prestressing steel shall be clean and free of loose rust, scale and pitting. A light oxide permissible. Unbonded steel shall be permanently protected from corrosion as shown on the drawings. Steel shall be protected against abrasion during shipment and handling.

3.2.1 Seven-Wire Strand and Strand Assemblies. Seven-wire high tensile stress-relieved strand shall conform to ASTM A 416. Strand assemblies shall be shop assembled. The anchor sleeves shall be of an alloy steel positively attached to the strand or strands, and the strand or strands shall be anchored to a cast-in-place bearing assembly with a threaded anchor, wedge, or cone of metal of proven corrosion compatibility as recommended by the material supplier.

3.3 Tendon Anchorage Assemblies. Anchorage assemblies must be set in a plane normal to the axis of the tendons such that uniform bearing on the concrete is assured. Friction or wedge type anchors shall not be used in inaccessible locations. Anchorage assemblies and connections shall be subject to the approval of the Contracting Officer and shall be capable of fully developing the minimum guaranteed ultimate strength of the tendon without excessive slip. Anchorage and end fittings shall be permanently protected against corrosion.

3.4 Tendon Splices. Wires of parallel-wire assemblies shall not be spliced.

No more than one strand shall be spliced in any one member where single strand tensioning is employed. Strand splices shall be capable of developing the full ultimate strength of the strand. Slippage of the splice shall be checked and correction made for differential slippage. Where multiple strand tensioning is used, not more than 10 percent of the strands in any member shall be spliced.

Strands to be spliced shall have the same lay or direction of twist and the ends shall be cut by shears or abrasive grinders.

3.5 Test Reports. Certified test reports showing the results of manufacturers' mill or plant tests performed by an independent laboratory shall be submitted to the Contracting Officer in advance of any prestressing operation. They shall show that the materials comply with the applicable specifications and shall include but not be limited to the following items: strand, reinforcing steels, and admixtures. Reports shall be furnished for each shipment and shall be identified with reels, heats, or other specific lots.

A system of identification shall be established showing disposition of tested materials and correlated with specific beds and members. These records shall be furnished the Contracting Officer before completion of the contract.

4. FORMWORK. Forms and formed surfaces shall conform to the applicable portions of the section: CONCRETE CONSTRUCTION of these specifications as well as to the following. Forms for pretensioned members shall be constructed to permit movement of the member without damage during release of the pretensioning force. Deflection of members due to the prestressing force and deformation of falsework shall be considered in the design. Forms shall be made and maintained true to the grade, alignment and dimensions shown on the drawings. Form joints shall be smooth and tight. Beds and forms shall be thoroughly cleaned before reuse.

5. TENSIONING OF TENDONS.

5.1 General. The stress induced in the tendons by any method of tensioning shall be determined independently by both (1) measurement of strand elongation and (2) direct measurement of force using a pressure gage and/or load cell. The results of these two measuremens shall check each other and the theoretical values within 5%. If they do not, the operation shall be carefully checked and the source of error determined and corrected before proceeding further.

NOTE: DETERMINATION OF THE INITIAL PRESTRESS FORCE MUST CONSIDER PRESTRESS LOSSES IN ACCORDANCE WITH ACI BUILDING CODE ACI 318, SECTION 18-6.

The concrete strength at transfer of stress shall be adequate for the requirements of the anchorages or for transfer through bond as well as meet camber or deflection requirements. In any case, concrete cylinder tests shall indicate a breaking strength of at least 4,500 pounds per square inch before transfer unless otherwise indicated on the drawings. The final prestress load in each unit after seating shall be as shown on the drawings. The prestressing steel shall not be placed until such time as all welding has been completed on any portion of the supports, or any part which might be in contact with the prestressing steel. The Contractor shall certify to the Contracting Officer that a technician skilled in the use of the prestressing system to be used will be available to give as much instruction in the operation as may be necessary to obtain satisfactory results. Safety measures shall be taken by the Contractor to prevent accidents caused by failure of a prestressing wire, tendon or component.

5.2 Pretensioning. Tendons may be tensioned by jacking of groups or may be tensioned individually by means of a single-strand jack. Before final tensioning of tendons, all tendons shall be brought to a uniform initial tension of approximately 1,000 pounds per strand per 200 feet of bed, with a minimum of 1,000 pounds and a maximum of 3,000 pounds per strand. The force corresponding to the initial tension shall be measured by a dynamometer or other approved method to aid in determining the final elongation. After this initial tensioning, the tendons shall be stressed to the total tension required by the plans using hydraulic or mechanical equipment with gages or dynamometers graduated and calibrated to accurately determine the load applied.

Draped pretensioned strands shall be tensioned partially by jacking at the end of the bed and partially by uplifting or depressing strands, or they shall be tensioned entirely by jacking, with the strands being held in their draped positions by means of rollers, pins or other approved methods during the jacking operation. Approved low-friction devices shall be used at all points of change in slope of strand trajectory at the time of tensioning of draped pretensioned strands regardless of the tensioning method used. Cable stress shall be maintained between anchorages until the concrete has reached a compressive strength as indicated in above paragraph: GENERAL.

5.3 Detensioning.

5.3.1 General. Forces from pretensioned strands shall be transferred to the concrete by either the multiple-strand release or the single-strand release method. The stress transfer shall not be performed until concrete strength, as indicated by test cylinders, has reached the transfer strength required in this section of the specifications. If concrete has been heat-cured, the detensioning shall be done immediately following the curing period while the concrete is still warm and moist. During detensioning, the prestressing forces shall be kept nearly symmetrical about the vertical axis of the member and shall be applied in a manner that will minimize sudden loading. Maximum eccentricity about the vertical axis shall be limited to one strand.

5.3.2 Multiple-Strand Release. In this method, all strands shall be detensioned simultaneously and the load transferred gradually to the concrete by hydraulic jacking.

6. PRECAST-PRESTRESSED CONCRETE CONSTRUCTION.

6.1 Fabrication. Fabrication of precast-prestressed members shall follow the applicable provisions of the Prestressed Concrete Institute Manual for Quality Control except as specified herein. Shop drawings must be approved by the Contracting Officer before any fabrication is begun. Unless otherwise shown on the contract drawings, the following dimensional tolerances of members will govern:

6.1.1 Cross Section Dimensions. Dimensions less than 6", plus or minus 1/8"; 6" to 18", plus or minus 3/16"; 18" to 36", plus or minus 1/4"; over 36", plus or minus 3/8".

6.1.2 Overall Length. Plus or minus 1/8" per 10', max. plus or minus 3/4".

6.1.3 Deviations from a Straight Line. 1/8" per 10', max. plus or minus 3/4".

6.1.4 Deviation from Specified Design Chamber After Installation. Plus or minus 1/8" per 10' of span length.

6.1.5 Differential Camber Between Adjacent Units after Installation. plus or minus 1/16" per 10' of span length.

6.2 Marking. All precast units shall be plainly marked and identified for ready correlation with corresponding test specimens. Pickup points shall be plainly marked on all units. Units shall be marked to show the number, size and location of reinforcement bars and to identify the top face and the position on the placement drawings. Units designed specifically to be erected adjacent to other units with which they are to function, shall be adequately match-marked before removal from the casting bed.

6.3 Erection. Points of support used in handling, transportation, storage and erection of members shall be as close as practical to the final points of bearing. All erection details including shoring and bracing shall be clearly shown on the shop drawings. Extreme care shall be taken during storage, hoisting and handling to prevent cracking and damage. Members damaged during handling, storage or erection shall be replaced by the Contractor at his expense.

7. ACCURACY OF STRESS AND ELONGATION MEASUREMENT.

7.1 Stress Measurement. Hydraulic gages, dynamometers, load cells or other devices for measuring stressing load shall have an accuracy of reading within two percent. Gages shall be calibrated for the jacks for which they are used by approved testing laboratory and a certified testing curve shall accompany each gage. Recalibration shall be performed at any time that a gaging system shows indication of erratic results in the opinion of the Contracting Officer and, in any case, at intervals not greater than 12 months. Gages shall indicate loads directly in pounds or be accompanied by a chart which converts dial readings into pounds.

7.2 Elongation Measurement. After the initial force has been applied to a tendon, reference points for measuring elongation due to additional tensioning forces shall be established. They shall be located according to the method of tensioning and type of equipment. The system used shall be capable of measuring the true elongation plus or minus 1/16 inch.

8. INSPECTION. The Contractor's facilities shall be open for inspection by the Contracting Officer at any time. The Contractor shall maintain full and accurate records of all materials incorporated into prestressed concrete. Manufacturer's test reports shall be submitted on all tendon steels and anchor assemblies, reinforcing steels, cement, admixtures, and curing materials. All concrete and cement testing shall be as provided in the section: CONCRETE CONSTRUCTION. Complete tensioning records shall be maintained by the Contractor showing date of tensioning, description, location and identification of the tendon members, manufacturer and size of tendon, identification of jacking equipment, final and initial design load for each tendon, theoretical elongation per tendon, actual tensioning load per tendon, and actual elongation per tendon. Certified calibration records for each set of jacking equipment shall be submitted to the Contracting Officer prior to the start of tensioning.

* * * * *

SECTION 4H

GROUTING STONE PROTECTION

Index

1. Applicable Publications
2. Materials
3. Mixing
4. Placing

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 Federal Specification.
SS-C-1960/3 Cement, Portland

1.2 U.S. Department of the Army, Corps of Engineers, Handbook for Concrete and Cement.
CRD-C 300-72 Membrane-Forming Compounds for Curing Concrete

2. MATERIALS.

2.1 Aggregate shall conform to the requirements specified for fine aggregate of the section: CONCRETE CONSTRUCTION.

2.2 Portland Cement shall conform to the requirements of Fed. Spec. SS-C-1960/3, Type I and/or Type II. The alkali content of the cement shall not exceed 0.6 percent.

2.3 Water shall be fresh, clean, and potable.

3. MIXING. Grout shall be composed of cement, sand, and water mixed in the proportions as directed. The estimated cement content requirement per cubic yard of grout is 7-1/2 sacks. The water content of the mix shall not exceed 8-1/2 gallons per sack of cement. In calculating total water content of the mix, the amount of moisture carried on the surfaces of aggregate particles shall be included. Slump of grout mix shall be between 9 and 10 inches for the first course and between 7 and 8 inches for the second course or where one course is placed. The grout shall be mixed in a concrete mixer in the manner specified for concrete, except that time of mixing shall be as long as is required to produce a satisfactory mixture, and the grout shall be used in the work within a period of 30 minutes after mixing. Retempering of grout will not be permitted. The consistency of the grout shall be such as to permit gravity flow into the interstices of the stones with the help of spading, rodding, and brooming. Grout batches in the same course shall be uniform in mix, size, and consistency.

4. PLACING. Prior to grouting, the stone shall be flushed with water to wash down the fines and to prevent absorption of water from grout. The stone shall be kept wet just ahead of the actual placing of grout. The grout shall be placed in one course in invert and in 2 courses in side slopes. Each course shall be placed full width or in successive lateral strips approximately 10 feet in width, as applicable, extending from toe of slope to top on side slopes. The grout shall be brought to the place of final deposit by approved means and discharged directly on the stones using a splash plate of metal or wood to prevent displacement of stone directly under the discharge. The flow of grout shall be directed with brooms or other approved baffles to cover the entire area and to assure that all crevices are filled. Sufficient barring shall be done to loosen tight pockets of stone and otherwise aid the penetration of grout. The first course shall fully penetrate the stone blanket. The second course shall be placed as soon as the first course has sufficiently stiffened so that it will not flow when additional grout is added. On side slopes, all brooming shall be uphill, and after the second course has stiffened the entire surface shall be rebroomed to eliminate runs in the top course and to fill voids caused by sloughing of the layers of grout. After completion of any strip or panel, no workmen or other load shall be permitted on the grouted surface for a period of 24 hours. The grouted surface shall be protected from injurious action of the sun; shall be protected from rain, flowing water, and mechanical injury; and shall be moist cured or membrane cured at the Contractor's option. Moist curing shall consist of covering the grout with a uniform thickness of 2 inches of sand which shall be kept continuously saturated for a period of 14 days.

Membrane curing compound shall be a pigmented curing compound, conforming to Corps of Engineers Serial No. CRD-C 300.

The curing compound shall be applied as soon as the free water disappears and shall be applied in a 2-coat continuous operation by approved power-spraying equipment at a rate of not to exceed 200 square feet per gallon for the combined coats. The second coat shall be applied to overlap the first coat in a direction approximately at right angles to the direction of the first application.

* * * * *

SECTION 4J

DRILLING AND GROUTING

Index

1. Applicable Publications
2. General
3. Equipment
4. Grouting Materials
5. Drilling and Grouting
6. Quality Control

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by references thereto.

1.1 U.S. Army Corps of Engineers, Handbook for Concrete and Cement.

CRD-C 103-60	Sieve Analysis of Fine and Coarse Aggregate for Use in Portland Cement Concrete
CRD-C 113-68	Moisture Content of Aggregate by Lose in Weight by Drying

1.2 American Society for Testing and Materials (ASTM) Standard.

A 120-73	Black and Hot Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Use

1.3 American National Standards Institute (ANSI) Standard.

B 16.3-1971	Malleable Iron Threaded Fittings, 150 and 300 lb.

2. GENERAL.

2.1 Program. The work contemplated consists of foundation exploratory drilling and grouting the bedrock beneath the abutments of the dam along the cutoff trench, the spillway crest, the outlet works and Dike I. The approximate locations, limits, and details are indicated on the drawings. The program shown on the drawings and described herein is tentative and is presented for the purpose of canvassing bids. The drilling and grouting shall be done after stripping and cleaning of the abutments and after excavation of the trench and the outlet works. The amount of drilling and grouting which actually will be required is unknown, and will be governed by conditions encountered as the work progresses. The Government reserves the right to increase or to eliminate any part of the drilling and grouting program should conditions indicate this as being desirable.

2.2 Procedures. The sequence in which the holes are drilled and grouted will be determined in the field and shall be as directed. All grouting mixes, pressures, pumping rates and other specific grouting operations shall be controlled by and in the presence of the Contracting Officer.

3. EQUIPMENT.

3.1 General. All drilling and grouting equipment used shall be of a type, capacity, and condition suitable for doing the work, as determined by the Contracting Officer. The power and equipment and the layout thereof shall meet all applicable requirements of local, state, and Federal regulations and codes, both safety and otherwise, and the applicable requirements of the "SPECIAL PROVISIONS". Sufficient lighting facilities shall be provided and maintained such that all drilling and grouting operations, including calking of grout leaks, can be satisfactorily performed.

3.2 Drilling Equipment. Standard core and grout hole drilling equipment shall be used. The drill rigs used for exploratory core drilling shall be similar or equal to the No. 8 Chicago Pneumatic with hydraulic feed. The drill rigs used for grout hole drilling shall be of size equal or greater than a No. 55 Chicago Pneumatic as conditions require. At the option of the Contractor, either coring or non-coring bits may be used for drilling grout holes. Nx coring bits shall be used for exploratory drilling. A Sprague and Henwood Series "M" core barrel, or equal, shall be used for drilling exploratory holes. Water shall be furnished in sufficient quantity to insure drilling operations will not be delayed by a shortage.

3.3 Grouting Equipment. Grout plants shall be capable of supplying, mixing, stirring and pumping grout to the satisfaction of the Contracting Officer. Each plant shall have a minimum capacity of 30-40 g.p.m. of grout injected at a pressure not greater than 150 psi. The plants shall be maintained in first-class operating condition at all times and any grout hole that is lost or damaged due to mechanical failure of equipment or inadequacy of grout supply shall be replaced by another hole, drilled by the Contractor at his expense. Each grout plant shall include the following minimum equipment.

3.3.1 Two specially equipped, air-driven, single screw type pumps or other approved type.

3.3.2 A mechanically driven grout mixer capable of effectively mixing and stirring the grout and which can be emptied into a sump without interrupting grout pump operations. It shall have a capacity of not less than 3/4 the capacity of the sump. The mixer shall be equipped with a suitable water measuring device calibrated to read in cubic feet and tenths and so designed that after each delivery the hands can be conveniently set back to zero. (Similar and equal to Neptune Disc Meter, Model 106 with 6-inch vertical dial).

3.3.3 A mechanically agitated sump, so designed as to be capable of effectively stirring and holding in suspension all solid matter contained in the grout. It shall have a minimum capacity of 16 cubic feet and a means of measuring the quantity contained to 0.1 cubic feet.

3.3.4 A tank for auxiliary water supply to be used in pressure testing, flushing, and pressure washing operations.

3.3.5 Such valves, pressure hose, small tools, and accessories as may be necessary to provide a continuous supply of grout and accurate pressure control. The inside diameter of the delivery line shall be not less than 1-1/2 inches and have a length not more than 200 feet from the sump to the header and be connected and operated such that objectionable blocking of the line will not take place when pumping at the minimum discharge capacity of the pump.

3.3.6 A 100-mesh vibrating screen with a minimum of 576 square inches of screening area for screening grout from the grout hole return line to the sump.

3.3.7 Ground plugs and packers and attachment devices of an approved type for pressure testing and grouting of grout and exploratory holes.

3.3.8 A water meter graduated in gallons per minute for use in pressure testing operations.

3.3.9 Pressure gages graduated to read 0 to 150 psi for use in pressure testing and grouting operations. An accurately calibrated, high precision pressure gage shall be furnished for periodically checking the accuracy of all gages.

3.3.10 A pressure gage graduated to read 0 to 50 psi with no greater than 2 psi divisions on the dial for use in grouting operation at shallow depths.

3.3.11 Sufficient stop cocks and screw caps for capping holes within 50 feet of grouting operations.

3.3.12 A variety of caulking tools with a supply of quick setting mortar, sacked sand, oakum, lead wool, and such other materials that would be useful in sealing grout leaks through open fractures and joints.

3.4 The arrangement of the grouting equipment shall be such as to provide a continuous circulation of grout throughout the system and to permit accurate pressure control by operation of a valve on the grout return line, regardless of how small the grout take may be. Any hole being grouted shall be no farther than 200 feet from the grout pump. The equipment and lines shall be prevented from becoming fouled by the constant cirulation of grout and by the periodic flushing out of the system with water. Flushing shall be done with the grout intake valve closed, the water supply valve open, and the pump running at full speed. Either of the following two distinct arrangements of connecting and operating grout equipment may be required.

3.4.1 Direct grouting shall be done by connecting the grout supply hose to the grout pipe with a "direct grouting header" as shown on the drawings. This method shall be used on clean holes which pressure tests indicate may take a significant amount of grout.

3.4.2 Packer grouting shall be done by setting a packer in the hole at the depth directed and using a direct grouting header. Several packer settings may be used during one grouting operation.

3.5 Records. The Contracting Officer will keep records of all drilling and grouting operations, such as a log of the exploratory and grout holes, results of washing and pressure testing operations, time of each change of grouting operation, pressure, rate of pumping, amount of cement for each change in water-cement ratio, and other data as deemed by him to be necessary. The Contractor shall furnish all necessary assistance and cooperation to this end.

3.6 Communications. When, for his own convenience, the Contractor has the individual elements of his plant so located that communication by normal voice between these elements is not satisfactory, the Contractor shall install a satisfactory means of communication, such as a telephone or other suitable device.

3.7 Lighting. The Contractor shall furnish weatherproof, minimum 300 watts each, light clusters on portable stands, in such quantity and with cables, bulbs, etc., as to provide adequate lighting for all elements of grout operations in the event grouting must be extended into hours of darkness. A power source, furnished by the Contractor, shall be available at all grout operation locations.

3.8 Protection to Work and Cleanup. During grouting operations the Contractor shall take such precautions as may be necessary to prevent drill cuttings, equipment exhaust oil, wash water, and grout, from defacing or damaging any part of the permanent structure. The Contractor will be required to furnish such pumps as may be necessary to care for waste water and grout from his operation. The Contractor shall upon completion of his operations remove all grout pipe above the foundation surface, clean up all waste resulting from his operations that is unsightly or would interfere with the efficient operation of the project as anticipated by the original design. All holes or depressions thus formed shall be patched with a mortar composed of one part portland cement, two parts sand, and an admixture containing unpolished aluminum powder. The admixture shall consist of one pound unpolished aluminum powder dry mixed with 50 pounds of portland cement. Five ounces of this mixture shall be added to each sack of portland cement. The patching shall be done in a neat and workmanlike manner so as to provide a surface smoothness at least equal to undisturbed areas of the concrete surface. Prior to final acceptance of the work, all concrete surfaces shall be cleaned and restored to their original condition, as nearly as practicable as determined by the Contracting Officer.

4. GROUTING MATERIALS.

4.1 Water. Water to be used for drilling, washing, pressure testing and grouting operations shall be clear and free from any sediment. Water shall be furnished by the Contractor and shall be supplied in quantities to prevent interruption of any of these operations.

4.2 Cement. Cement used in grout shall be Type II and shall conform to the requirements of section: CONCRETE CONSTRUCTION. Only cement furnished in cloth or paper bags will be accepted for use in the work. A bag (sack) shall contain 94 pounds net. A sufficient quantity of cement shall be stored at or near the site of the work to insure that grouting operations will not be delayed by shortage of cement. In the event the cement is found to contain lumps or foreign matters of a nature and in amounts which, in the opinion of the Contracting Officer, may be deleterious to the grouting operations, such cement shall be removed from the site at no cost to the Government.

4.3 Pipe. All metal pipe and fittings required for constructing grout and exploratory holes, grout hole connections and air vents shall conform to ASTM A 120, standard weight, galvanized. All fittings shall conform to ANSI Standard B 16.3, 150 lb. class.

5. DRILLING AND GROUTING.

5.1 General. All exploratory grout and grout holes shall be drilled at the locations shown on the drawings or as directed. Exploratory grout and grout holes may be drilled to depths ranging to 75 feet or as directed. All exploratory grout or grout holes shall be washed, pressure tested and grouted. The location of the first series of holes (primary) shall be determined by conditions in the field. The location of intermediate holes (secondary series) shall be determined by the split-spacing method. The number of grout holes may be increased, progressively, by the split-spacing method, as desired.

5.2 Installing Pipe for Grouting. The Contractor may be required to furnish and install pipe for drilling and grouting as directed. The grout pipes shall be securely anchored into the firm bedrock. The pipes are to be inserted by flaring the bottom of the pipe, or other approved methods, then grouting or caulking it in place with some suitable material to preserve alinement, to prevent entry of foreign materials into the hole, and to prevent leakage. The pipe and fittings shall be cleaned thoroughly of all dirt, grease, oil, grout and mortar immediately before embankment. All joints shall be made up snug and the assembly held securely in position and protected from damage or displacement. The Contractor shall take all necessary precautions to prevent any pipe from becoming clogged or obstructed from any cause and any pipe which becomes clogged shall be cleaned out in a manner satisfactory to the Contracting Officer at the Contractor's expense. The presence of tramp metal such as nails, wire, bolts, nuts, and other foreign material in the pipes through which grout holes are to be drilled shall be considered as obstructions.

5.3 Grout Hole Drilling. Grout holes shall be drilled into firm bedrock through pipes embedded in the bedrock. Grout holes shall be drilled with standard rotary non-percussion drilling equipment as hereinbefore designated. No core recovery will be required and the type of bit used shall be optional with the Contractor. The minimum diameter of hole shall be 1-3/8-inches at the point of maximum penetration. Drilling shall be done in accordance with the procedures hereinafter described. The use of grease, "rod dope" or other lubricant on rotary drill rods will not be permitted except that an approved neutral liquid soap may be added to the drill water. Each hole shall be protected from becoming clogged or obstructed by means of a cap or other suitable device on the collar and any hole that becomes clogged or obstructed before completion of operations shall be cleaned out in a manner satisfactory to the Contracting Officer or another hole provided by and at the expense of the Contractor. Whenever the drill water is lost, or artesian flow is encountered, the drilling operations shall be stopped and the hole grouted before drilling operations are resumed in such hole. The grout within a partially completed hole shall be removed therefrom by washing or other methods before it has set sufficiently to require redrilling. Redrilling required because of the Contractor's failure to clean out a hole before the grout has set shall be performed at the Contractor's expense.

5.4 Definition and Procedure for Drilling and Grouting. The drilling and the grouting shall be done in sections using split spacing, stage grouting method as described herein.

5.4.1 Zone. A zone is a predetermined partial depth of grouting. The first zone extends 25 feet downward from bottom of the grout pipe. The second zone extends 25 feet downward from the bottom of the first zone. In general, all grouting in a given zone and section will be finished before work is started in the next underlying zone. Also, grouting of second zone in any one section shall not begin until the first zone of the adjoining section is completed.

5.4.2 Section. A section is a reach in the grout area, not more than 200 feet in length in which grouting operations will not be permitted at the same time that drilling is in progress. In so far as practicable, the grout area will be subdivided into sections in a manner which will facilitate the Contractor's operations. Hole spacing for any one arrangement of holes will be varied in accordance with conditions encountered and as directed.

5.4.3 Stage. A stage is a partial or complete depth of hole within any given zone. The actual depth of a stage depends upon geologic conditions encountered in drilling. It may vary from a fraction to the full depth of the zone, and is marked by the loss or gain of drill water in appreciable amounts or by some other conditions which prevent the hole from being drilled to the full depth of a particular zone.

5.4.4 Split Spacing. Split spacing is the procedure of locating an additional grout hole between two previously drilled and grouted holes.

5.5 Stage Grouting. Stage grouting is a complete cycle of drilling and grouting of any portion of a hole or all of the hole within a given zone. It involves the placement of a grout curtain by drilling and grouting in successive operations in accordance with the following general procedure.

5.5.1 Primary holes for grouting shall be drilled within the first zone. The depths will be governed by the foundation conditions. Normal spacing of primary holes is 40 feet.

5.5.2 After the grouting of any hole, the grout within the hole shall be removed by washing or by other methods before it has set sufficiently to require redrilling.

5.5.3 After the interval of time as specified in paragraph STAGE GROUTING PROCEDURES has elapsed the primary holes not already drilled to the limit of the first zone shall be drilled as directed by the Contracting Officer to additional depths not exceeding the zone limit.

5.5.4 The primary holes thus deepened shall again be washed and pressure tested and then grouted at higher pressures as directed by the Contracting Officer.

5.5.5 The process of successfully drilling primary holes to additional depths and grouting at higher and higher pressures in stages in all the zones, shall be repeated until all of the primary holes in a section have been completely drilled and grouted as directed by the Contracting Officer.

5.5.6 After the primary holes in all the zones have been completed as specified above, the secondary holes shall be drilled in a manner similar to the primary holes. These and succeeding series of holes are determined by the "split spacing method," and shall be drilled and grouted to the depth of the first zone in like manner until the first zone of that section is completely grouted as directed.

5.5.7 The process of successively drilling to specified depths and grouting at higher pressure in stages for the first series of holes and then for succeeding series of holes shall be repeated for the second zones of that section. Other sections along the grout curtain shall be grouted in like manner until grouting is completed, to the satisfaction of the Contracting Officer. As the drilling and grouting work progresses, it may develop that conditions are such that all or parts of the foundation already grouted require additional grouting. In such event, the equipment shall be returned and additional holes for grouting shall be drilled and grouted as directed by the Contracting Officer and no additional allowance above the contract prices will be made for drilling and grouting such holes or for the expense of any movement of equipment to the performance of such work.

5.6 Washing and Pressure Testing. Immediately before the pressure grouting of each stage of any hole is begun, the hole shall be thoroughly washed under pressure and pressure tested with clean water. Minimum pump capacity shall be 50 g.p.m. All intersected rock seams and crevices containing clay or other washable materials shall be washed with water and air under pressure to remove as much of these materials as possible. If practicable, as determined by the Contracting Officer, such materials shall be ejected from one or more holes by introducing water and air under pressure into an adjacent hole. In no case shall such pressure exceed the maximum grouting pressure as directed by the Contracting Officer. All holes sufficiently tight to build up the maximum required pressure shall be washed at such pressure and the washing shall continue as long as there is any increase in the rate at which water is taken such increase indicating that fractures are being opened by the washing operation. Open holes in which no pressure can be built up shall be washed for a period of 5 minutes, with the pump operating at full capacity or a minimum of 50 g.p.m., or for such period of time as fracture-filling is being removed, as evidenced by the escape of muddy water through surface openings or other grout holes.

5.6.1 Area Preparation Prior to Grouting. Prior to grouting, all faults and seams in the immediate area which might interfere with the grouting operation shall be cleaned, as directed, free from oil standing or running water, mud, drummy rock, coatings, debris, and loose or unsound fragments of rocks. All surfaces shall be cleaned thoroughly by air blasting and by other approved methods. Water shall not be used in the cleaning.

5.7 Stage Grouting Procedures.

5.7.1 First Stage. The Contractor shall perform the first stage or low-pressure grouting, by washing and grouting holes at locations indicated on the drawings or as directed. Before grouting is begun in any hole of a given series in any section, at least the two adjacent holes in advance of each such hole shall be completely drilled for the same stage and the adjacent hole completely washed and pressure tested to facilitate washing and flushing out of any intervening clay-filled seams, fractures, or solution openings.

5.7.2 Second Stage. After all first stage grouting in any section has been completed, as specified above, the Contractor shall proceed, when so directed, with second stage drilling and grouting in accordance with the procedure outlined herein but in no case cshall the deepening of any hole preparatory to grouting be commenced before a minimum period of 24 hours has elapsed since completion of the previous stage-grouting at the hole, nor shall second stage grouting be conducted within a distance of approximately 50 feet of any hole in which a previous stage of grouting has been completed until the grout in such previous stage holes has set for a period of 24 hours. Grouting at subsequent stages shall conform to the same requirements as to minimum time and distance.

5.8 Grouting. All pressure grouting operations shall be performed in the presence of the Contracting Officer, and shall be in accordance with the following general procedure.

5.8.1 Grout Mixes. Mixes shall be in the proportion directed by the Contracting Officer who will, from time to time, direct changes to suit the conditions in the particular grout hole as revealed by the drilling and grouting operations. The water cement ratio by volume will be varied to meet the characteristics of each hole and will range between 0.6 to 6.0, the greater part of grout probably being placed at a ratio of about 2.0 to 4.0. The grout shall be neat cement consisting of cement and water.

5.8.2 Grouting Pressures. Grouting pressures to be used in the work will vary with conditions encountered in the respective holes and the pressures used shall be as directed by the Contracting Officer. It is anticipated that pump pressures will range from 0 to 80 psi but in no event will pressure in excess of 100 psi be required.

5.8.3 Grout Injection. In general, if pressure tests indicate a tight hole, grouting shall be started with a thin mix. If an open hole condition exists, as determined by loss of drill water or inability to build up pressure during washing operations, then grouting shall be started with a thicker mix and with the grout pump operating as nearly as practicable at constant speed at all times; the ratio will be decreased, if necessary, until the required pressure has been reached. When the pressure tends to rise too high, the water-cement ratio shall be increased as may be required to produce the desired results. If necessary to relieve premature stoppage, periodic applications of water under pressure shall be made. Under no conditions shall the pressure or rate of pumping be increased suddenly, as either may produce a water-hammer effect which may promote stoppage. The grouting of any hole shall not be considered complete until that hole refuses to take any grout whatsoever at 3/4 the maximum pressure required for the stage. Should grout leaks develop and grout escape through open fractures or grout pipes, plugging, caulking, or capping will be required as directed. In general, surface grout leaks through open fractures shall be sealed with a thick mortar containing a quick setting agent. At times, however, oakum, lead wool or other such materials may be used. Grout escaping through adjacent grout holes shall be capped and before the grout has set, the grout pump shall be connected to each of these holes and the grouting completed at the pressures specified as directed. Once grouting has been started it shall be continued to completion without any interruption whatsoever. If, due to size and continuity of fracture, it is found impossible to reach the required pressure after pumping a reasonable volume of grout at the minimum workable water-cement ratio, the speed of the pumping shall be reduced. Following such reduction in pumping speed, if the desired result is not obtained, grouting in the hole shall be discontinued when directed by the Contracting Officer. In such event, the hole shall be cleaned, the grout allowed to set, and additional drilling and grouting shall then be done in this hole or in the adjacent area as directed, until the desired resistance is built up. After grouting of any hole, the pressure shall be maintained by means of a stopcock or other suitable device until the grout has set to the extent that it will be retained in the hole. Grout that cannot be placed, for any reason within 2 hours after mixing shall be wasted. If such grout is mixed at the direction of the Contracting Officer or with his knowledge or consent, such wasted grout (except grout or the material constituents thereof, wasted due to the improper anchorage of the grout pipe or connections, negligence on the part of the Contractor, or improper mixing) will be paid for at the contract prices for the materials contained therein. After grout has set in completed holes, the hole shall be kept filled with grout to ground surface by hand pouring. Any holes in which the grouting is omitted shall be filled with grout to ground surface by hand pouring. Any grout holes lost due to insufficient cement or other materials shall be replaced by the Contractor at no additional cost to the Government.

5.9 Exploratory Grout Hole Drilling.

5.9.1 General. Exploratory holes shall be drilled in order to explore the foundation material and to check the penetration of the grout. Exploratory holes shall be located by the Contracting Officer. The core holes shall be drilled to the depths and angles directed and the core diameter shall be NX-ized core – 2-1/8-inches diameter. The drilling shall be done in a workmanlike manner and, in order to insure maximum core recovery, the coring equipment used shall be similar in construction and equal in performance to Sprague and Henwood "M" series equipment. Exploratory holes shall be washed to their full depth, pressure tested, and pressure grouted as specified.

5.9.2 Core Boxes shall be well constructed of new, seasoned fir and plywood and shall be of such length, width, and height that four 4-foot cores may be placed in each box, separated by firmly fastened wooden strips and equipped with at least six screws each. Standard hardware hooks, 2 inches in length, and eyes will be attached to the covers opposite the hinges so the covers can be firmly hooked to the box. Each box shall contain sufficient loose wooden blocks, 2-1/8 x 2-1/8 x 5/8 inches, to be used as markers for the bottom end of each core run. Details of core boxes to be used in the work shall be submitted for approval prior to their construction. Core boxes shall be ready for use well in advance of their actual need so that at no time will it be considered necessary to employ makeshift methods in storing the core samples. The Contractor shall furnish sufficient core boxes to accommodate all cores recovered. A separate core box or group of boxes shall be provided for each core hole drilled. All core boxes shall be constructed for NX size cores.

5.9.3 Procedure. The drilling shall be done in a workmanlike manner and all necessary precautions shall be taken to secure the best possible cores. The core barrel shall be pulled as soon as the advance is equal to core capacity of the core barrel or as often as is necessary to prevent injury to the cores whichever is shorter. As soon as any core block occurs, the core barrel shall be pulled. The core shall then be removed, placed in a wooden V-trough, washed and placed in proper sequences in core boxes. The depth of each core run shall be suitably and legibly marked on wooden blocks used for separating the core runs. As each box is filled with the core samples, it shall be suitably and legibly marked with project name, hole number, depth, and other pertinent information as directed. No box shall contain cores from more than one hole. The boxes shall be delivered in the vicinity of the work, as directed. Exploratory holes may be grouted under pressure, if conditions so indicate, but in all cases the holes will be grouted to full depth.

6. QUALITY CONTROL. In addition to records kept by the Contracting Officer the Contractor shall establish and maintain quality control for all drilling and grouting to assure compliance with contract requirements and maintain records of his quality control for all operations including but not limited to the following:

(a) Drilling of exploratory grout and grout holes. Records of drilling should provide plan showing location of all holes and information on type of drilling equipment used, depths of drilling, drilling rates, washing and pressure testing and depths of water loss.

(b) Grouting. Records should be kept of type of grouting plant used, including all grouting equipment, grouting depths, grouting mixes, and amount of cement for each change in water cement ratio, pressures and pumping rates, ambient temperature, and grout takes and wastage, and time of each change of grouting operation.

6.1 Records and Tests. A copy of these records and tests as well as the records of corrective action taken, will be furnished the Government as required in paragraph: CONTRACTOR QUALITY CONTROL of section: GENERAL REQUIREMENTS.

* * * * *

SECTION 5B

REINFORCED MASONRY

Index

1. Applicable Publications
2. Definitions
3. Submittals
4. Delivery, Storage, and Handling
5. Environmental Conditions
6. Materials
7. Mortar and Grout
8. Preparation of Concrete Surfaces
9. Installation

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by references thereto.

1.1 U.S. Army Corps of Engineers Publications.

CRC-C 566-64	Grout Fluidifier

1.2 American Concrete Institute (ACI) Standard.

315-74	Manual of Standard Practice for Detailing Reinforced Concrete Structures (6th Ed., 2d Prtg., April 1975)

1.3 American Society for Testing and Materials (ASTM) Standards.

A 82-76	Cold Drawn Steel Wire for Concrete Reinforcement
A 153-73	Zinc-Coating (Hot-Dip) on Iron and Steel Hardware
A 615-76a	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
C 5-59 (R 1974)	Quicklime for Structural Purposes
C 33-74a	Concrete Aggregates
C 39-72	Compressive Strength of Cylindrical Concrete Specimens
C 90-75	Hollow Load-Bearing Concrete Masonry Units
C 91-75	Masonry Cement
C 94-74a	Ready-Mixed Concrete
C 144-76	Aggregate for Masonry Mortar
C 150-76a	Portland Cement
C 207-76	Hydrated Lime for Masonry Purposes
C 270-73	Mortar for Unit Masonry
C 404-76	Aggregates for Masonry Grout
C 426-70 (R 1976)	Drying Shrinkage of Concrete Block

2. DEFINITIONS.

2.1 Grout Lift and Grout Pour. A grout lift is defined as the layer of grout placed in a single continuous operation. A grout pour is defined as the entire height of grout fill placed in one day and is composed of a number of successively placed grout lifts.

3. SUBMITTALS.

3.1 Samples. The following samples shall be submitted for approval before work is started.

(1) Anchors and Ties - Two of each type proposed for use.

(2) Concrete Masonry Units - Shapes, sizes, and kinds in sufficient numbers to show full range of color and texture.

3.2 Certificates of Conformance or Compliance. Before delivery of the following materials, notarized certificates, in triplicate attesting that materials meet the requirements specified shall be submitted for approval.

(1) Concrete Masonry Units

(2) Reinforcing Bars

3.3 Certified Laboratory Test Reports. In addition to the submittal of certificates specified herein, certified copies, in triplicate, of the reports of all tests listed below and required in referenced publications for the following materials shall be submitted for approval. The testing shall have been performed by an approved independent laboratory acceptable to the Contracting Officer within 6 months of submittal of reports for approval. Test reports on a previously tested material shall be accompanied by notarized certificates from the manufacturer certifying that the previously tested material is of the same type, quality, manufacturer, and make as that proposed for this project.

(1) Concrete Masonry Units - Linear drying shrinkage, compressive strength and absorption of each type of unit and popout and staining properties of lightweight aggregates used in the units.

(2) Mortar and Grout

3.4 Shop Drawings. The following shop drawings shall be submitted for approval prior to delivery of the materials to the job site.

(1) Reinforcing Bars. Shop drawings for reinforcing bars shall include plans, elevations, and details showing treatment of reinforcing at turns and offsets; intersections of similar and dissimilar materials; tops, bottoms, and ends of walls; and wall openings. Shop drawings shall also show details of positioning devices used to hold the vertical reinforcing bars in the proper position within the cells.

4. DELIVERY, STORAGE, AND HANDLING. Handle, store, and protect masonry units in a manner to avoid chipping, breakage, or contact with the soil or contaminating materials and exposure to the elements. Deliver concrete masonry units to the jobsite in air dry condition as defined hereinafter. Keep anchors and ties free of rust. Steel reinforcing bars shall be free of loose scale and rust. Deliver grout and mortar materials in unbroken bags, or other approved containers, plainly marked and labeled with the manufacturers' names and brands. Store cementitious materials in dry, weathertight sheds or enclosures or under watertight tarpaulins. Store and handle grout and mortar materials in a manner which will prevent the inclusion of foreign materials and damage by water or dampness.

5. ENVIRONMENTAL CONDITIONS.

5.1 Hot Weather Installation. Masonry erected when the ambient air temperature is more than 99 degrees F. in the shade and the relative humidity is less than 50 percent shall be protected from direct exposure to wind and sun for 48 hours after installation.

5.2 Cold Weather Installation. No frozen work shall be built upon. Do not lay masonry during temperatures below minus 10 degrees F. unless authorized in writing. Before erecting masonry during temperatures below 40 degrees F., submit for approval a written statement giving the methods proposed to heat the masonry materials and to protect the masonry from freezing. Keep masonry units completely covered and free from frost, ice, and snow at all times and maintain them at a minimum temperature of 32 degrees F. when laid. Maintain temperature of mortar and grout between 40 degrees F. and 120 degrees F. by heating mixing water and/or sand. Temperature of mixing water or of water and sand introduced to cement shall not exceed 160 degrees F.

6. MATERIALS.

6.1 General. The source of materials which will affect the appearance of the finished work shall not be changed after the work has started. Wire gages specified herein are American Steel Wire Gages. Materials shall conform to the respective specifications and other requirements specified hereinafter.

6.2 Admixtures. The high-lift grout admixture shall conform to CRD-C 566 and in addition shall produce an expansive action in the plastic grout sufficient to offset initial water loss shrinkage and promote bonding of the grout to all interior faces of the masonry units. Other admixtures may be used in mortar or grout provided that the admixture does not adversely effect bond or compressive strength of mortar or grout designed without the use of the admixture. Anti-freeze compounds shall not be used. The admixtures shall not contain calcium chloride salts or any other chemical that will adversely affect metals or the coatings of metals embedded in the mortar or grout.

6.3 Aggregate for Grout.

6.3.1 Fine Aggregate. ASTM C 404 or C 144.

6.3.2 Pea Gravel. Clean or washed gravel conforming to ASTM C 404, except that 100 percent shall pass the 3/8-inch screen and not more than 5 percent shall pass the No. 8 sieve.

6.3.3 Coarse Aggregate. ASTM C 404, size No. 8 or ASTM C 33, 3/4-inch maximum size as indicated in Grading Table for coarse aggregates.

6.4 Aggregate for Mortar. ASTM C 144, except that not less than 3 percent nor more than 15 percent shall pass the No. 100 sieve. Aggregate used in mortar for joints 1/4 inch or less shall have 100 percent passing the No. 8 sieve with 10 percent being retained on the No. 16 sieve.

6.5 Anchors, Ties, and Centering Devices.

6.5.1 Wire Devices. Factory fabricated from steel wire conforming to ASTM A 82. Wire devices in exterior walls shall be formed from wire that has been zinc coated in accordance with ASTM A 153, Class B-2.

6.5.1.1 Centering clips shall be formed from not lighter than 9 gage wire. Clips shall be of a design that will prevent displacement of the reinforcing bars during the course of construction.

6.5.1.2 Wire anchors for use with embedded slots or wire inserts shall be formed from not lighter than 9 gage wire looped and closed.

6.6 Portland Cement. ASTM C 150, Type I, II or III, including the requirements for low alkali content.

6.7 Concrete Masonry Units.

6.7.1 The linear drying shrinkage of concrete masonry units shall not exceed 0.045 percent when tested in accordance with ASTM C 426.

6.7.2 Kinds and Shapes. Concrete masonry units of the various kinds shall conform to the specifications references below. Units shall include closer, jamb, header, lintel, and bond beam units and special shapes and sizes to complete the work as indicated. All units used in exposed masonry surfaces shall have a uniform fine to medium texture and a uniform color.

6.7.3 Hollow Concrete Masonry Units. ASTM C 90, Type I, grade N-I having an oven-dry weight of 125 to 105 pounds per cubic foot. Color and texture shall be as indicated.

6.8 Lime Paste. Lime paste shall be made with pulverized quicklime or hydrated lime. Hydrated lime processed by the steam method shall be allowed to soak not less than 24 hours. Quicklime and other hydrated lime shall be allowed to soak not less than 72 hours. In lieu of hydrated-lime paste for use in mortar, the hydrated lime may be added in the dry form.

6.8.1 Hydrated Lime. ASTM C 207, type S.

6.8.2 Pulverized Quicklime. ASTM C 5, except 100 percent shall pass the No. 20 sieve and 90 percent shall pass the No. 50 sieve.

6.9 Mortar Coloring. Chemically inert, finely ground limeproof pigment.

6.10 Reinforcing Bars. ASTM A 615, grade 40.

6.11 Water. Water used in mortar and grout shall be taken from a supply distributed for domestic purposes and at the time of mixing shall be clean and free of acids, alkalies, or other organic materials.

7. MORTAR AND GROUT.

7.1 Mortar shall be Type S in accordance with the proportion specifications of ASTM C 270 as modified below. The mortar shall have a flow, after suction, of 70 percent or more when tested for water retention in accordance with ASTM C 91, except mortar shall be mixed to an initial flow of 125 to 135 percent.

7.1.1 Color. Mortar coloring, not to exceed 15 percent of the weight of cement, shall be added to the mortar used for exposed masonry surfaces to produce a uniform color matching the concrete masonry unit. The color pigment should be ground into the cement at the cement mill or shall be furnished in accurately premeasured and packaged units that can be added without measuring to a measured amount of cement.

7.2 GROUT.

7.2.1 Proportions. Grouts shall be mixed in laboratory established proportions to attain a compressive strength at 28 days of not less than 3,000 pounds per square inch when tested in accordance with ASTM C 91 for fine aggregate and ASTM C 39 for grout containing coarse aggregate. Grout shall be classified as fine, low lift, and high lift types as specified below and shall be used subject to the limitations of Table III, hereinafter.

7.2.1.1 Fine Grout. Fine grout shall consist of portland cement, lime paste or hydrated lime, and fine aggregate mixed with sufficient water to obtain a pouring consistency without segregation of the constituents. Slump shall be approximately 5 inches.

7.2.1.2 Low-Lift Grout. Low-lift grout shall consist of portland cement, lime paste or hydrated lime, fine aggregate and coarse aggregate mixed with sufficient water to obtain a pouring consistency without segregation of the constituents. Slump shall be approximately 5 inches. Maximum size of coarse aggregate for grout shall be in accordance with Table III.

7.2.1.3 High-Lift Grout. High-lift grout shall consist of portland cement, grout admixture, fine aggregate, and pea gravel or coarse aggregate mixed with sufficient water to obtain a consistency suitable for pumping without segregation of the constituents. Slump shall be between 9 and 11 inches. The maximum size of coarse aggregate shall be in accordance with Table III.

7.2.2 Mixing. Batching and mixing of high-lift grout, including equipment used therin, shall conform to the applicable requirements of ASTM C 94.

8. PREPARATION OF CONCRETE SURFACES. Clean laitance, dust, dirt, oil, organic matter or other foreign materials from concrete surface upon which reinforced masonry is to be placed. Use sandblasting, if necessary, to remove laitance from pores and to expose the aggregate.

9. INSTALLATION.

9.1 Laying Masonry Units. Space back-up courses to level with facing courses where metal ties occur. Adjust each unit to its final position while mortar is still soft and plastic. Remove and relay in fresh mortar, any unit that is disturbed after mortar has stiffened. Keep chases, raked-out joints, and spaces to be grouted free from mortar and other debris. Units used in exposed masonry surfaces shall be free from chipped edges or other imperfections detracting from the appearance of the finished work.

9.1.1 Tolerances. Lay masonry plumb, true to line, with courses level. Bond pattern shall be kept plumb throughout. Lay masonry within the following tolerances.

9.1.1.1 Variation from the plumb in the lines and surfaces of columns, walls and arises.

(1) In adjacent masonry units - 1/8-inch.

9.1.1.2 Variations from the plumb for external corners.

(1) In any story or 20 feet maximum - 1/4-inch.

9.1.1.3 Variations from the level or grades indicated on the drawings for exposed horizontal grooves, and other conspicuous lines.

(1) In any bay or 20 feet maximum - 1/4-inch.

9.1.1.4 Variations of the linear building lines from established position in plan and related portion of columns, walls, and partitions.

(1) In any bay or 20 feet maximum - 1/2-inch.

9.1.1.5 Variation in cross sectional dimensions of columns and in thickness of walls.

(1) Minus - 1/4-inch.

(2) Plus - 1/2-inch.

9.1.2 Cutting and Fitting. Wherever possible, use full units of the proper size in lieu of cut units. Cutting and fitting, including that required to accommodate the work of others, shall be done by masonry mechanics using power masonry saws. Concrete masonry units shall be wet cut. Wet cut units, before being placed in the work, shall be dried to the same surface-dry appearance as uncut units being laid in the wall. Cut edges shall be clean, true and sharp. Make openings carefully so that wall plates, cover plates or escutcheons required by the installation will completely conceal the openings and will have bottoms parallel with the masonry joints. Cut webs of hollow masonry units to the minimum required for proper installation.

9.1.3 Embedded Items. Fill spaces around built-in items with mortar. Anchors, ties, wall plugs, accessories, flashings, pipe sleeves and other items required to be built-in shall be built-in as the masonry work progresses. Embed anchors, ties and joint reinforcement fully in the mortar.

9.1.4 Unfinished Work. Step back unfinished work for joining with new work. Do not use toothing. Remove loose mortar and thoroughly clean the exposed joints before laying new work.

9.1.5 Do not wet concrete masonry units. Do not lay units having a film of water or frost on the surface.

9.1.6 Jointing. Tool joints when the mortar is thumbprint hard. Tool horizontal joints first. Brush joints to remove all loose and excess mortar. Mortar joints shall be finished as follows.

9.1.6.1 Tooled Joints. Joints in exposed masonry surfaces shall be tooled slightly concave. Tool joints with a jointer slightly larger than the joint width so that complete contact is made along the edges of the unit. Perform tooling so that the mortar is compressed and the joint surface is sealed. Use a jointer of sufficient length to obtain a straight and true mortar joint.

9.1.6.2 Raked Joints. In exposed exterior masonry surfaces, rake joints between door frames and abutting masonry walls to a depth of 3/4-inch ready for calking. On the interior side of exterior door frames rake joints between door frames and abutting masonry walls to a depth of 3/8-inch.

9.1.7 Joint Widths. Joint widths shall be approximately 3/8-inch wide.

9.1.8 Forms and Shores. Where required, constuct forms to the shapes, lines, and dimensions of the members indicated. Construct forms sufficiently rigid to prevent deflections which may result in cracking or other damage to supported masonry and sufficiently tight to prevent leakage of mortar and grout. Do not remove supporting forms or shores until the supported masonry has acquired sufficient strength to support safely its weight and any construction loads to which it may be subjected. In no case shall supporting forms or shores be removed in less than 10 days. At least 16 hours shall have elapsed after grouting masonry columns or walls before applying uniform loads and an additional 48 hours shall have elapsed before applying concentrated loads.

9.2 Reinforced Hollow Unit Masonry. Reinforced hollow unit masonry shall consist of hollow concrete masonry units reinforced vertically and horizontally with steel bars located within cells or kerfs in the units and with all cells filled solidly with grout. Lay hollow masonry units so as to preserve the vertical continuity of cells filled with grout. The minimum clear horizontal dimensions of vertical cores shall be 2 inches by 3 inches.

9.2.1 Cleanouts. Provide cleanout holes at the bottom of every pour in cores containing vertical reinforcement when the height of the grout pour exceeds 24 inches. Where all cells are to be grouted, construct cleanout courses with open-bottom bond beam units inverted to permit cleaning of all cells by flushing. Establish a new series of cleanouts if grouting operations are stopped for more than 4 hours. Cleanouts shall be not less than 3- by 4-inch openings cut from one face shell. Manufacturer's standard cut-out units may be used at the Contractor's option. Do not plug cleanout holes until masonry work, reinforcement, and final cleaning of the grout spaces have been completed.

9.2.2 Bond Pattern. Except where stacked bond is indicated, lay hollow masonry units in running bond.

9.2.3 Mortar Joints. Fill bed joints with mortar for the full thickness of the face shell. Where all cells are to be grouted, spread cross webs with mortar at grout barriers only. Butter head joints for the full thickness of the face shell and shove the units into place. Avoid fins of mortar that protrude into cells to be grouted.

9.2.4 Bond Beams and Bond Beam Lintels. Bond beams and bond beam lintels shall consist of bond beam units, reinforced as indicated but with not less than two No. 4 bars where not indicated and filled with grout. Use open bottom type bond beam units over cells to be filled.

9.3 Placing Reinforcing Steel. Prior to placing grout, clean all reinforcement of loose, flaky rust, scale, grease, mortar, grout, or other coating which might destroy or reduce its bond with the grout. Unless otherwise indicated, the details of reinforcement shall conform to ACI 315. Do not bend or straighten reinforcing in a manner injurious to the steel. Do not use bars with kinks or bends not shown on the drawings. Placement of reinforcement shall be inspected and approved prior to placing grout. Vertical bars shall be spliced only where indicated.

9.3.1 Positioning Bars. Position vertical bars accurately at the lateral position indicated. Maintain a minimum clearance between the bars and masonry units of 1/2-inch and between parallel bars of one diameter of the reinforcement. Hold vertical reinforcing in place using metal supports, centering clips, spacers, ties, or caging-devices located near the ends of each bar. Wire column and pilaster ties in position around the vertical steel; laying ties in mortar joints will not be permitted.

9.3.2 Splices. Locate splices only where shown on the drawings. Stagger splices in adjacent bars. Lap bars a minimum of 40 diameters of the reinforcement or 2 feet whichever is greater. Welded or mechanical connections shall develop at least 125 percent of the strength of the reinforcement.

9.4 Placing Grout. Place grout using a hand bucket, concrete hopper, or grout pump. Place grout so as to completely fill the grout spaces without segregation of the aggregates. Where grouting is discontinued for more than one hour, stop the grout 1-1/2 inches below the top of a course to form a key at pour joints. The height of grout pours and type of grout used shall be limited by the dimensions of grout spaces as indicated in Table III.

9.4.1 Grouting Equipment.

9.4.1.1 Grout Pumps. Pumping through aluminum tubes will not be permitted. Operate pumps to produce a continuous stream of grout without air pockets. Upon completion of each day's pumping, eject grout from pipeline without contamination or segregation of the grout. Remove waste materials and debris from the equipment. Dispose of waste materials, debris, and all flushing water outside the masonry.

9.4.1.2 Vibrators. Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the grout. Apply vibrators at uniformly spaced points not further apart than the visible effectiveness of the machine. Limit duration of vibration to time necessary to produce satisfactory consolidation without causing segregation.

9.4.2 Low-Lift Method. Place grout as masonry is erected at a rate that will not cause displacement of the masonry due to hydrostatic pressure of the grout. If mortar has been allowed to set prior to grouting, remove all fins protruding more than 1/2-inch into the grout space. Place grout in final position within 2-1/2 hours after mixing when air temperature is 80 degrees F. or higher and 3-1/2 hours after mixing when the air temperature is less than 80 degrees F. Rod or puddle grout during placement using a one inch by 2 inch wood stick or a mechanical vibrator to insure complete filling of the grout space. Do not insert the vibrators into lower pours that are in a semi-solidified state.

9.4.3 High-Lift Method. Lay masonry to the top of a pour before placing grout. Do not pour grout in hollow unit masonry until mortar joints have set for at least 24 hours. Clean mortar droppings from the bottom of the grout space and from reinforcing steel. Remove mortar fins protruding more than 1/2-inch into the grout space by dislodging the projections with a rod or stick as the work progresses or by washing the grout space at least twice a day during the erection using a high pressure stream of water. Place grout in final position within 1-1/2 hours after mixing when air temperature is 80 degrees F. or higher and 2-1/2 hours after mixing when the air temperature is less than 80 degrees F. Place grout in lifts not to exceed 4 feet in height, with a waiting period between lifts, dependent on weather and absorption rate of the masonry, in order to place the succeeding lift after the preceding lift becomes plastic but prior to initial set. The first lift shall be consolidated using mechanical vibrators. After the required waiting period, place the second lift and consolidate with the vibrator extending 12 to 18 inches into the previous lift. Do not insert vibrators into lower pours that are in a semi-solidified state. Repeat the waiting, pouring, and consolidating process until the top of the grout pour is reached. Reconsolidate the top pour after the required waiting period. The high-lift grouting of any section of wall between laterial flow barriers shall be completed to the top of a pour in one working day unless a new series of cleanout holes is established and the resulting horizontal construction joint cleaned.

9.4.4 Blowouts. Brace walls against wind and other forces during construction. Allow sufficient time between lifts to preclude cracking of face shells of hollow masonry units. If blowouts, misalignment, or cracking of face-shells should occur during construction, tear down and re-build the wall at no additional cost to the Government.

9.5 Pointing and Cleaning. After mortar joints have attained their initial set but prior to hardening, completely remove mortar and grout daubs or splashings from exposed masonry surfaces. Before completion of the work, rake out all defects in joints in exposed masonry surfaces, fill with mortar and tool to match existing joints. Immediately after grout work is completed remove scum and stains which have percolated through the masonry using a high pressure stream of water. Do not use metal tools or metal brushes for cleaning.

9.5.1 Concrete Masonry Units. Dry brush exposed concrete masonry unit surfaces at the end of work each day and after any required pointing. Use stiff-fiber bristled brushes only.

TABLE III

POUR HEIGHT AND TYPE OF GROUT FOR VARIOUS GROUT SPACE DIMENSIONS

Grout Space Dimensions		Grout		Maximum
Minimum Horizontal Dimensions of Core (inches)	Minimum Width of Collar Joint (inches)	Type (See Paragraph entitled "Grout")	Course Aggregate	Height of Grout Pour (inches)
2 x 3	3/4	Fine or mortar	None	8
	2	Fine or low lift	ASTM C 404, Size 8	8
2 x 4		Fine or mortar	None	16
2-1/2 x 4		Fine or low lift	ASTM C 404, Size 8	24
3 x 4	3	High lift	3/8-inch pea gravel	72*
3-1/2 x 4	3-1/2	High lift	3/8-inch pea gravel	180*
5 x 6		High lift	ASTM C 33, 3/4-inch Max.	180*

*Where only cells of hollow masonry units containing reinforcement are grouted, the maximum height of the pour shall not exceed the distance between bond beams.

* * * * *

SECTION 5C

STONE VENEER

Index

1. Applicable Publications
2. Materials
3. Samples
4. Handling and Storage
5. Sample Panel
6. Erection
7. Pointing and Cleaning

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 American Society for Testing and Materials (ASTM) Specification.

A 82-76	Cold-Drawn Steel Wire for Concrete Reinforcement
A 153-73	Zinc Coating (Hot Dip) on Iron and Steel Hardware
C 270-73	Mortar for Unit Masonry

2. MATERIALS shall conform to the respective specifications and other requirements specified below.

2.1 Anchors and Ties shall be fabricated from steel wire conforming to ASTM A 82. Wire devices shall be hot-dip coated after fabrication with ASTM A 153, Class B-2.

2.2 Veneer Stone shall be of the tuffaceous sandstone type indigenous to the site of the work. Veneer stone shall be obtained from the required excavation for the overlook access roads and foundation for the overlook structure. Stone shall be cut to the sizes and shapes indicated and specified.

2.3 Mortar.

2.3.1 Mortar shall comply with the proportioning specifications for type N mortar set forth in ASTM C 270 and as modified herein, proportioned and tested in the laboratory. When tested for water retention, the mortar shall have a flow, after suction, of 75 percent or more when mixed to an initial flow of 125 to 140 percent. When tested for compressive strength, mortar shall be mixed to a flow of 100 to 115 percent.

3. SAMPLES. The following shall be submitted for approval, and in addition, representative samples shall be taken periodically from on-the-site stockpiles as required for testing or checking during the progress of the work.

Anchors and Ties: Two of each type proposed for use.

4. HANDLING AND STORAGE. Materials shall be handled, stored, and protected in an approved manner to avoid chipping, breakage, contact with soil or contaminating material, and exposure to the elements. Anchors and ties shall be kept free of rust.

5. SAMPLE PANEL. After material samples are approved a sample panel shall be built as part of the structure where directed. The sample panel shall be approximately 4 feet by 2 feet in size. Panel shall be representative of the finish work with respect to stone cutting, mortar joints including tooling, anchorage and bond. The approved sample panel shall be used as a standard of workmanship for the entire project.

6. ERECTION.

6.1 General. Both horizontal and vertical mortar joints exposed-to-view between stones shall not exceed 3/8 inch in width. Wires used for tying the stone in place during the mortaring shall be cut off beneath the surface and care exercised that all such ends are properly covered to prevent any occurrence of rust. Anchors shall be installed to provide not less than the support shown on the details, and in such a manner as to eliminate looseness or lack of fit or improper bends or kinks in wire.

6.1.1 Walls and Columns. Stone shall have beds and joints at right angles to the face, with sharp, true arrises. Stone shall be placed with layered edges (desert varnish texture) exposed. Exposed faces shall not exceed 4 inches in height nor 10 inches in length horizontal. No stone for walls shall exceed 3-inches minimum or 4-inches maximum in

thickness. Stone, when placed in its intended position, shall remain at rest before mortar is applied around and behind. In no case shall the overall distance from the backing wall to the exposed face exceed 5-inches. Stone shall be laid with not less than one inch of cement mortar between the stone and the backing wall. The bond between the stone and the mortar must be sufficient to withstand a shearing strength of 50 psi after curing for 28 days. All joints and the space behind the stone between the backing and stone shall be filled solidly with mortar and the joints shall be raked.

6.1.2 Capstones. Stone thickness shall not exceed 3-inches and exposed faces of capstones shall not exceed 6-inches by 12-inches. All joints and the space under the stone between the concrete surface and stone shall be filled solidly with mortar and the joints raked.

6.2 Hot-Weather Installation. Stone veneer erected when the ambient air has a temperature of more than 99 degrees F., in the shade, and has a relative humidity of less than 50 percent shall be protected from direct exposure to wind and sun for 48 hours after installation.

6.3 Cold-Weather Installation. No frozen work shall be built upon. Before erecting stone veneer during temperatures below 40 degrees F., a written statement shall be submitted and approval received for the methods proposed to heat the stone and protect the stone from freezing as required below. Stone shall be kept completely covered and free from frost, ice, and snow at all times and shall have a minimum temperature of 30 degrees F. when laid. Temperature of mortar shall be between 70 degrees F. and 110 degrees F. Temperature of mixing water or of water and sand introduced to cement shall not exceed 160 degrees F. The air temperature on both sides of the stone shall be maintained above 40 degrees F. for at least 72 hours but may be reduced to 48 hours if high-early-strength cement is used instead of portland cement or masonry cement in the mortar. No stone shall be laid at temperatures below minus 10 degrees F. unless authorized in writing.

6.4 Cutting and Fitting, including that required to accommodate the work of others, shall be done by masonry mechanics. Cut edges shall be clean, true, and sharp.

6.5 Unfinished Work shall be stepped back for joining with new work. Toothing may be resorted to only when specifically approved. Before laying new work, loose mortar shall be removed and the exposed joint shall be thoroughly cleaned. Surfaces of stone shall be dampened as required after cleaning to obtain good bond with subsequent work.

6.6 Protection. Stone not being worked on shall be properly protected at all times. When rain or snow is imminent, the tops of exposed walls over which stone is placed shall be covered with a strong nonstaining waterproof membrane well secured in place and in a manner that will prevent moisture from accumulating within the unfinished wall. Adequate provisions shall be made during construction to prevent damage by wind.

6.7 Mortar. Materials shall be accurately measured and mixed with as much water as may be necessary to produce the wettest workable consistency possible. Mortar shall be placed in final position within 2-1/2 hours after mixing. Mortar not used or that has started to set within this time interval shall be discarded. Mortar that has stiffened within the above time interval, because of evaporation of moisture from the mortar, shall be retempered to restore its workability.

6.8 Jointing. Joints exposed-to-view shall be tooled slightly concave with the mortar thoroughly compacted and pressed against the edges of the units. Tooling shall be done when the mortar is thumbprint hard. The tooled joints shall be finished to uniform lines and surfaces, smooth, and free of tool marks. Horizontal joints between top of stone and underside of concrete slab shall be filled with mortar unless otherwise indicated.

7. POINTING AND CLEANING. Mortar daubs or splashings, before setting or hardening, shall be completely removed from stone surfaces that will be exposed. Before completion of the work, all defects in joints of stone to be exposed shall be raked out as necessary, filled with mortar, and tooled to march existing joints. Stone surfaces shall not be cleaned, other than removing excess surface mortar, until mortar in joints has hardened. Stone surfaces shall be left clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations and with tight mortar joints throughout. Metal tools and metal brushes shall not be used for cleaning. Stone surfaces shall be dry-brushed at the end of each day's work and after any required pointing.

* * * * *

SECTION 5D

STONE PROTECTION

Index

1. Applicable Publications
2. Materials
3. Foundation Preparation
4. Placement
5. Scales
6. Waybills and Delivery Tickets

1. APPLICABLE PUBLICATIONS. The following American Society for Testing and Materials Standards of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

C 88-73	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
C 127-73	Specific Gravity and Absorption of Coarse Aggregate
C 136-71	Sieve or Screen Analysis of Fine and Coarse Aggregates
C 131-69	Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine
C 535-69 (R 1975)	Resistance to Abrasion of Large Size Coarse Aggregate by Use of the Los Angeles Machine
D 1141-52	Substitute Ocean Water

2. MATERIALS.

2.1 Source and Material Approval. The Contractor shall make all arrangements, pay all royalties, and secure all permits for the procurement, furnishing and transporting of materials. The sources from which the Contractor proposes to obtain the material shall be selected and a sample submitted a minimum of 45 days in advance of the time when the material will be required in the work. Stone from a proposed source where exploratory investigations and compliance test reports or satisfactory service records are not available, will be tested by the Government for quality compliance. The Government will test one sample at its expense. If the material fails the tests or if the Contractor desires to utilize more than one source, additional testing will be accomplished by the Government for the sum of $850 for each sample tested. The costs of such tests will be deducted from payment due the Contractor. All test samples (500 pounds minimum) shall be representative of the rock source and shall be obtained by the Contractor under the supervision of the Contracting Officer and delivered at the Contractor's expense to the South Pacific Division Laboratory, U.S. Army Engineer Division, South Pacific, Sausalito, California. A list of sources from which acceptable stone protection materials have been obtained is available for informational purposes in the office of the District Engineer, Foundations and Materials Branch, 300 North Los Angeles Street, Los Angeles, California. Sources listed may no longer be available due to depletion or may not be acceptable because of changes in the material. The Contractor shall vary the quarrying, processing, loading and placing operations to secure the type and quality of stone protection specified. If the stone being furnished by the Contractor does not fully meet all the requirements of these specifications, the Contractor shall furnish at no additional cost to the Government, other stone meeting the requirements of these specifications. Approval of stone from a source shall not be construed as a waiver of the right of the Government to require the Contractor to furnish stone which complies with these specifications. Materials produced from localized areas, zones or strata will be rejected when such materials do not comply with the specifications.

2.1.1 Stone of a suitable quality and in sufficient quantity necessary for stone protection may be obtained from the Borrow Area for Zone II and III embankment material. Processing of the material will be required to produce stone protection meeting the requirements of this specification.

2.2 Quality Compliance. Test results and service records may be used to determine the acceptability of the stone protection materials. In the event compliance test reports and/or service records are not available, the material shall be subjected to the tests outlined in these specifications to determine its acceptability for use in the work. Before a proposed new source of stone will be considered for sampling and testing, one of the following criteria must be met:

a. A sufficiently developed quarry operation to demonstrate that an adequate quantity of stone is available to fulfill the contract requirements; or,

b. An exposed face plus sufficient explorations (results of which are made available to the Government) to demonstrate that an adequate quantity of stone is available to fullfill the contract requirements.

2.2.1 Filter Material. Material shall contain no organic matter nor soft, friable particles, shall be clean, hard, and uncoated, and shall have a percentage of wear not to exceed 50 percent after 500 revolutions when tested in accordance with ASTM C131. Filter material may be obtained from required excavation.

2.3 Quality Compliance Tests for Stone Protection. Stone shall meet the following test requirements.

Test	Test Method	Requirement
Specific Gravity (Bulk SSD)	ASTM C 127	2.50 minimum
Absorotion	ASTM C 127	2.0% maximum
Wetting & Drying	SPD Test Procedure(1)	No fracturing(3)
Sodium Sulfate	ASTM C 88(2)	10% max. loss(4)
Abrasion Loss	ASTM C 535	50% max. loss

In addition to the above tests, the stone shall be subjected to a petrographic and X-ray diffraction analysis. The stone must not contain any swelling type clay (illite or montmorillonite).

NOTE: (1): Test procedure wetting-and-drying tests. The initial step of the test is the careful examination of the entire sample and the selection of representative test specimens. The piece should be large enough to produce two cut slabs, 1 inch thick (± 1/4 inch) with a minimum surface area of 30 square inches on one side. Two chunks approximately three by four inches are also chosen. The slabs and chunks are carefully examined under a low-power microscope and all visible surface features are noted and recorded. The specimens are then oven dried at 140 degrees F., for eight hours, cooled and weighed to the nearest tenth of a gram. The test specimens are photographed to show all surface features before the test. The chunks and slabs are then subjected to fifteen cycles of wetting and drying. One slab and one chunk are soaked in fresh tap water, the other slab and chunk are soaked in salt water prepared in accordance with ASTM D1141. Each cycle consists of soaking for sixteen hours at room temperature and then drying in an oven for eight hours at 140 degrees F. After each cycle the specimens are examined with the low-power microscope to check for opening or movement of fractures, flaking along edges, swelling of clays, softening or rock surface, heaving of micaceous minerals, breakdown of matrix material and any other evidence of weakness developing in the rock. The cycle in which any of these actions occurs is recorded. After fifteen cycles, the slabs and chunks are again carefully examined and all changes in the rocks are noted and recorded. The test specimens together with all flakes or particles which come off during the test are oven dried, weighed and photographed.

NOTE: (2): The test shall be made on 50 particles each weighing 100 grams, ± 20 grams, in lieu of the gradation given in C 88.

NOTE: (3): Weakening and loss of individual surface particles is permissible unless bond of the surface grains softens and causes general disintegration of the surface material.

NOTE: (4): Sandstones which have a loss greater than the specified limit will be accepted if the Contractor demonstrates that the rock has a satisfactory service record.

2.4 Gradation Sampling and Testing for Stone Protection. Tests shall be performed by an approved testing laboratory on samples selected by the Contracting Officer. The Government reserves the right to perform check tests and to use the Contractor's sampling and testing facilities to make the tests. Each sample shall consist of not less than two tons of materials and shall be selected at random from the production run. One gradation test is required at the beginning of production prior to delivery of stone to the project and a minimum of one additional test for each 20,000 tons of material placed. All sampling and gradation tests performed by the Contractor shall be under the supervision of the Contracting Officer.

2.5 Gradation.

2.5.1 General. All points on individual grading curves shall be between the boundary limits as defined by smooth curves drawn through specified grading limits plotted on a mechanical analysis diagram. The individual grading curves shall not exhibit abrupt changes in slope denoting skip grading or scalping of certain sizes. Specified grading of all material shall be met both at the source and as delivered to the project. In addition, material not meeting the required grading due to segregation or degradation during placement shall be rejected. If best results show that stone does not meet the required grading, the hauling operation will be stopped immediately and will not resume until processing procedures are adjusted and a gradation test is completed showing gradation requirements are met. All gradation tests shall be at the expense of the Contractor.

2.5.2 Filter Material. Filter material shall be well graded between the limits specified below when tested in accordance with ASTM C136.

Sieve Size	Percent Finer (by Weight)
6"	100
3"	70-90
No. 4	30-50
No. 40	10-30

2.5.3 Type I stone and grouted stone shall be reasonably well graded between 4 and 12 inches.

2.5.4 Riprap shall be reasonably well-graded within the limits specified below:

Sieve Size	Percent Smaller (by Weight)
18"	100
12"	40-80
6"	0-40
3"	0-5

3. FOUNDATION PREPARATION. Areas on which filter material or stone is to be placed shall be trimed and dressed to conform to cross sections indicated or directed, within an allowable tolerance of plus or minus one inch from the theoretical slope lines and grades. Where such areas are below the allowable minus tolerance limit they shall be brought to grade by filling with earth similar to the adjacent material and well compacted, or by filling with approved material, and no additional payment will be made for any material thus required. Immediately prior to placing the filter material or stone, the prepared base shall be inspected by the Contracting Officer and no material shall be placed thereon until that area has been approved.

4. PLACEMENT.

4.1 Filter Material shall be spread uniformly on the prepared base, in a satisfactory manner, to the neat lines indicated or directed. Placing of material by methods which will tend to segregate particle sizes will not be permitted. Any damage to the prepared surface of the base during placing of the filter material shall be repaired before proceeding with the work. Compaction of the filter material will not be required but it shall be finished to present a reasonably even surface free from mounds or windrows. A tolerance of plus or minus one inch from the slope lines and grades when measured with a 10-foot straightedge will be allowed in each finished course, except that either extreme of such tolerance shall not be continuous over an area greater than 200 square feet.

4.2 Type I Stone, Grouted Stone and Riprap shall be placed in a manner to produce a reasonably well graded mass with the minimum practicable percentage of voids, and shall be constructed to the lines and grades indicated or directed. Stone shall be placed to its full course thickness in one operation and in a manner to avoid displacing the underlying material. Method of placement shall be submitted to Contracting Officer for approval prior to commencement of placement operations. The Contractor shall maintain the stone protection until accepted and any material displaced by any cause shall be replaced at his expense to the lines and grades shown on the drawings. Self propelled equipment shall not be used on the levee slopes and/or toe slopes. Hand placing, barring, or placing by crane will be required only to the extent necessary to secure the results specified. Placing stone by dumping into chutes or by similar methods likely to cause segregation will not be permitted. A tolerance of ±3" from the indicated slope lines and grades will be allowed in the finished surface, except that either extreme of such tolerance shall not be continuous over an area greater than 200 square feet.

5. SCALES shall be standard truck scales of the beam type. The scales shall be of sufficient size and capacity to accommodate all trucks used in hauling the material. Scales shall be tested, approved, and sealed by an inspector of the State Inspection Bureau charged with scales inspection within the state in which the project is located. Scales shall be calibrated and resealed as often as necessary to insure continuous accuracy. The necessary number of standard weights for testing the scales shall be on hand at all times and, if an official inspection bureau of the state is not available, the scales will be tested by the Contracting Officer.

6. WAYBILLS AND DELIVERY TICKETS. Copies of waybills or delivery tickets shall be submitted to the Contracting Officer during the progress of the work. Before the final statement is allowed, the Contractor shall file with the Contracting Officer certified waybills and/or certified delivery tickets for all stone actually used in the construction covered by the contract.

* * * * *

SECTION 6A

MISCELLANEOUS METAL AND MATERIALS

Index

1. Applicable Publications
2. General
3. Dissimilar Materials
4. Materials
5. Shop Drawings
6. Samples
7. Workmanship
8. Qualification of Welders
9. Anchorage
10. Wall Vents
11. Handrails
12. Miscellaneous Plates and Shapes
13. Shop Painting
14. Restroom Signs
15. Permanent Project Signs
16. Elastomeric Bearing Pads

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 Federal Specifications.

L-S-125B	Screening, Insect, Nonmetallic
FF-B-588C & Am-1	Bolt, Toggle: and Expansion Sleeve, Screw
FF-H-00111b (GSA-FSS)	Hardware, Builders'; Shelf and Miscellaneous
FF-S-85C & Am-1	Screw, Cap, Slotted and Hexagon Head
FF-S-92B & Am-1	Screw, Machine: Slotted, Cross-Recessed or Hexagon Head
FF-S-111D	Screw, Wood
FF-S-325 & Int. Am-3 (GSA-FSS)	Shield, Expansion; Nail Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry)
FF-W-84a & Am-2	Washers, Lock (Spring)
RR-W-365 & Am-1	Wire Fabric (Insect Screening)
TT-V-51F	Varnish: Asphalt

1.2 Military Specifications.

MIL-M-17194C & Am-2	Metal, Expanded, Steel
MIL-C-18480A (DOCKS) & Am-3	Coating Compound, Bituminous, Solvent; Coal Tar Base

1.3 American Association of State Highway and Transportation Officials (AASHTO) Specification.

M 251-74	Laminated Elastomeric Bridge Bearings

1.4 American Society for Testing and Materials (ASTM) Standards.

A 36-75	Structural Steel
A 48-74	Gray Iron Castings
A 53-75	Welded and Seamless Steel Pipe
A 123-73	Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
A 163-66	Zinc-Coated (Galvanized) Wrought Iron Sheets
A 386-73	Zinc Coating (Hot-Dip) on Assembled Steel Products
A 525-75	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements

1.5 American Welding Society (AWS) Standards.

B 3.0-41	Qualification Procedure (Reprint April 1969)
D 1.1-75 (Rev 1-76)	Structural Welding Code

2. GENERAL. The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Welding to or on structural steel shall be in accordance with the Structural Welding Code of the American Welding Society. Items specified to be galvanized, when practicable and not indicated otherwise, shall be hot-dip processed after fabrication. Galvanizing shall be in accordance with ASTM Specifications A 123, A 163, A 386, or A 525, as applicable. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. Miscellaneous bolts and anchors, supports, braces, and connections necessary for completion of the miscellaneous metalwork shall be provided. The necessary rebates, lugs, and brackets shall be provided so that the work can be assembled in a neat and substantial manner. Edges of flanged items shall be turned to form plaster keys where plaster occurs. Holes for bolts and screws shall be drilled or punched. Poor matching of holes shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

3. DISSIMILAR MATERIALS. Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of bituminous paint conforming to Military Specification MIL-C-18480 or to Federal Specification TT-V-51, unless otherwise specified, to prevent galvanic or corrosive action.

4. MATERIALS shall conform to the requirements specified for the particular item; and where these requirements are not specified in detail, the materials shall be suitable for the intended usage of the item. The materials listed below shall conform to the respective specifications and other requirements as designated below.

4.1 Aluminum. Unless otherwise specified, aluminum items shall be in standard mill finish.

4.2 Anchors.

4.2.1 Expansion Shields. Federal Specification FF-S-325.

4.2.2 Toggle Bolts. Federal Specification FF-B-588.

4.3 Expanded Metal shall conform to Military Specification MIL-M-17194, type II, class 1 or class 2.

4.4 Fasteners.

4.4.1 Bolts and Nuts shall be suitable for use intended.

4.4.2 Powder-Driven Fasteners may be used only when approved in writing.

4.4.3 Screws. Federal Specification FF-S-85, FF-S-92, and FF-S-111, as best suited for use intended.

4.4.4 Washers. Federal Specification FF-W-84 for lock washers. Flat washers shall be suitable for use intended.

4.5 Hardware. Unless otherwise specified, hardware provided as an integral part of miscellaneous metal items shall conform to Federal Specification FF-H-111.

4.6 Insect Screen. Federal Specification RR-W-365, type II, III, or VII, 18 by 16 mesh, or Federal Specification L-S-125, type II, bronze or aluminum color, 18 by 16 mesh.

4.7 Cast Iron Castings. ASTM Standard A 48.

5. SHOP DRAWINGS, along with catalog cuts, templates, and erection and installation details, as appropriate, for all miscellaneous metal items shall be submitted for approval in accordance with the SPECIAL PROVISIONS. Submittals shall be complete in detail; shall indicate thickness, type, grade, class of metal, and dimensions; and shall show construction details, reinforcement, anchorage, and installation with relation to the building construction.

6. SAMPLES shall be full size, shall be taken from manufacturer's stock, and shall be complete as required for installation in the work. After approval, samples may be installed in the work, provided each sample is clearly identified and its location recorded. One sample of any item shall be submitted for approval upon request by the Contracting Officer.

7. WORKMANSHIP. Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled to a close fit. Corner joints shall be coped or mitered, well formed, and in true alinement. Work shall be accurately set to established lines and elevations and securely fastened in place. Work shall be executed and finished in accordance with approved drawings, cuts, details, and samples.

8. QUALIFICATION OF WELDERS. Welding to or on structural steel or miscellaneous items of structural steel shall be performed by certified welders qualified in accordance with procedures covered in American Welding Society Standard B 3.0 using procedures and materials and equipment of the type required for the work.

9. ANCHORAGE shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; through bolts, lag bolts, and screws for wood. Slotted inserts shall be of types required to engage with the anchors and shall be approved.

10. WALL VENTS shall be two-piece type, 7-5/8- by 15-5/8 and 2-1/4- by 8-inch sizes as indicated, and shall be of cast aluminum with integral water stop. Insect screen shall be installed at the back of the vent. Louvered opening shall have top and bottom drip lips, and the net ventilating area with closer or damper open shall be at least 35 percent of the gross wall opening. The frames shall have a structural strength adequate to permit use in masonry walls without a lintel. Where indicated, vents shall include an upturned duct section, formed in a 90-degree bend, attached to interior of the ventilated opening to deter infiltration of windblown materials.

11. HANDRAILS.

11.1 Steel Railing including pipe inserts in concrete shall be standard-weight steel pipe conforming to ASTM Specification A 53. Pipe shall be 2-inch size. Pipe railings shall be galvanized.

11.1.1 Fabrication. Jointing of post, rail, and corners shall be by one of the following methods.

11.1.1.2 Mitered and Welded Joints made by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Railing splices shall be butted and reinforced by a tight-fitting interior sleeve not less than 6 inches long.

11.1.1.3 Railings May Be Bent At Corners in lieu of jointing, provided bends are made in suitable jigs and that the pipe is not crushed.

11.1.2 Installation.

11.1.2.1 Except as hereinafter specified, rails shall be installed by means of steel pipe sleeve inserts or preformed holes, set and anchored in the concrete as indicated. Posts shall be inserted into the steel pipe sleeves or preformed holes, leveled, plumbed, and alined. The annular space between pipe posts and pipe sleeve inserts shall be filled solid with molten lead or sulphur or a quick-setting hydraulic cement.

11.1.2.2 Rails shall be anchored to bridge at gaging station, by means of expansion shields and bolts.

12. MISCELLANEOUS PLATES AND SHAPES such as lintels, sill angles, miscellaneous mountings, and frames, shall be provided to complete the work. Miscellaneous plates and shapes shall conform to ASTM Specification A 36.

13. SHOP PAINTING. Unless otherwise specified, surfaces of ferrous metal, except galvanized surfaces, shall be cleaned and shop coated with the manufacturer's standard protective coating. Items to be finish painted shall not be given a bituminous protective coating. Surfaces shall be cleaned with solvents to remove grease and oil and with power wire-brushing or sandblasting to remove loose rust, loose mill scale, and other foreign substances. Surfaces of items embedded in concrete shall not be painted.

14. RESTROOM SIGNS. Signs shall conform to the applicable requirements of the Department of Interior, National Park Service Sign System Specifications. Sign faces shall be reflective plastic sheeting laminated to metal panels. Background color of sheeting shall be brown. Signs shall be installed at the locations indicated on the drawings and shall be of the types shown on drawings. Restroom signs shall be mounted on wall where shown. Fastening to wall shall be in an approved manner.

15. PERMANENT PROJECT SIGN shall be constructed as indicated.

15.1 Concrete and concrete finish shall conform to the applicable requirements of the section: CONCRETE CONSTRUCTION.

15.2 Lumber shall be redwood, rough sawn, Clear All Heart grade, as graded by the Redwood Inspection Service. Sandblasting shall be as indicated. Templates or masking shall be provided as required to protect adjacent surfaces.

16. ELASTOMERIC BEARING PADS shall conform to requirements of AASHTO M 251. The Contractor shall furnish to the Contracting Officer a certification by the manufacturer that the elastomer, and fabric (if used), in the elastomeric bearing pads to be furnished conforms to the specification requirements.

* * * * *

SECTION 6D

FENCES

Index

1. Applicable Publications
2. Materials
3. Installation of Fence

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 Federal Specifications (Fed. Spec.).

RR-F-191G/GEN	Fencing, Wire and Post, Metal (and Gates, Chain-Link Fabric, and Accessories)

1.2 American Society for Testing and Materials (ASTM) Standards.

B 32-70	Solder Metal
C 94-74a	Ready-Mixed Concrete

2. MATERIALS shall conform to Fed. Spec. RR-F-191C/GEN and other requirements specified below:

2.1 Chain-Link Fabric. Fed. Spec. RR-F-191, type 1, 2 oz. coating and shall be 9 gage wire woven in a 2-inch mesh.

2.2 Concrete. ASTM C 94, using 3/4-inch maximum size aggregate, and having minimum compressive strength of 3,000 p.s.i. at 28 days. Grout shall consist of one part portland cement to 3 parts clean, well-graded sand and the minimum amount of water to produce a workable mix.

2.3 Accessories for Chain-Link Fences. Federal Specification RR-F-191, Zinc coated except as modified herein.

2.3.1 Gates. Gates shall have truss rods or intermediate braces. Gate fabric shall be attached to the gate frame by method standard with the manufacturer except that welding will not be permitted. Latches shall be arranged for padlocking so that padlock will be accessible from both sides of the gate regardless of the latching arrangement. All gate hinges shall be the non-removable bolt-pin type.

2.3.2 Deleted.

2.3.3 Reinforcing or Tension Wire. Minimum Tensile strength of 80,000 pounds per square inch, zinc-coated.

2.3.4 Tie Wire. Aluminum alloy of 0.144-inch diameter for attaching fabric to top rail and to intermediate posts. Hog rings of 0.110-inch diameter aluminum wire shall be used for attaching fabric to top and bottom wires. Preformed clips of 6-gage zinc-coated steel wire may be used for attaching fabric to intermediate posts.

2.3.5 Post Braces and Truss Rods. For each gate, corner, pull, or end post. Truss rods shall be provided with turnbuckles or other equivalent provisions for adjustment.

2.3.6 Post, Rails, and Braces. The posts, rails, and braces, except for bridge fence, shall be either round or H-Section; however, the same type shall be used throughout the project. For bridge fence, round members only shall be used.

3. INSTALLATION OF FENCE.

3.1 General. The fence shall be installed to the alinement indicated. Fence installation shall be in accordance with the fence manufacturer's written installation instructions except as modified herein.

3.2 Post Setting. Posts shall be set plumb and in alinement. Posts shall be set in concrete bases of dimensions indicated except where posts are set in preformed holes. Concrete shall be thoroughly compacted so as to be free of voids and finished in a dome. Braced pull posts shall be installed at fence ends, intersections, each change in direction of 10 degrees or more horizontally, and at each grade change of 5 degrees or more. Straight runs between braced pull posts shall not exceed 500 feet. In preformed holes, posts shall be set with a minimum of 1 inch of grout around each post. Grout shall be thoroughly worked into the hole so as to be free of voids and finished in a dome. Concrete and grout shall be cured a minimum of 72 hours before any further work is done on the posts.

3.3 Post Tops shall be installed as recommended by the manufacturer.

3.4 Top and Bottom Reinforcing Wires shall be installed before installing chain-link fabric and shall be pulled taut.

3.5 Fabric shall be pulled taut and secured to the topwire and bottom wire close to both sides of each post and at intervals of not more than 24 inches on centers. Fabric shall be attached to the sides of the post away from the enclosed opening. Fabric shall be secured to braced pull posts using stretcher bars and ties or clips or by integrally weaving to integral fastening loops of ends, corner, pull, and gate posts for the full length of each post. Fabric shall be attached to line posts at not greater than 15 inches on center using ties or clips. Splices in fabric shall be made with suitable splicing wire. Edges of fabric made by field cuts shall be knuckled or barbed as applicable.

3.6 Gate shall be installed as indicated. Hinge bolts shall be installed in drilled holes in the gate posts. Bolts and nuts shall be tack welded to gate posts.

3.7 Repair. In the event that any portion of galvanized items is abraded or otherwise damaged to the extent that the base metal is exposed, such damaged or abraded portions shall be neatly covered with Grade 50B solder conforming to the requirements of ASTM Specification B 32.

* * * * *

SECTION 8D

CULVERTS

Index

1. Applicable Publications
2. Delivery, Storage, and Handling of Materials
3. Manufacturer's Recommendations
4. Tests for Pipe
5. Pipe for Culverts
6. Drainage Structures
7. Materials for Drainage Structures
8. Concrete Pipe Joints
9. Corrugated Metal Pipe Joints
10. Excavation and Trenching for Pipe Culverts
11. Bedding
12. Placing Pipe
13. Backfilling

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 Federal Specifications (Fed. Spec.).

HH-P-117	Packing; Jute, Twisted
SS-S-210A & AM-1 (GSA-FSS)	Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints
WW-P-405B & Am-1	Pipe, Corrugated (Iron or Steel, Zinc Coated)

1.2 American Association of State Highway and Transportation Officials (AASHTO), Publications.

M 170-76I	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

1.3 American Society for Testing and Materials (ASTM), Publications.

C 76-75	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
C 270-73	Mortar for Unit Masonry

2. DELIVERY, STORAGE, AND HANDLING OF MATERIALS.

2.1 Delivery and Storage. Materials delivered to site shall be inspected for damage, unloaded, and stored with the minimum of handling. Do not store materials directly on the ground. Inside of pipes and fittings shall be kept free of dirt and debris.

2.2 Handling. Materials shall be handled in such a manner as to insure delivery to the trench in sound undamaged condition. Pipe shall be carried to the trench not dragged. Gasket materials and plastic materials that are not to be installed immediately shall not be stored in the direct sunlight.

3. MANUFACTURER'S RECOMMENDATIONS. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Contracting Officer prior to installation. Installation of the item will not be allowed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

4. TESTS FOR PIPE. Certified copies of test reports demonstrating conformance to applicable pipe specifications shall be delivered to the Contracting Officer before pipe is installed. Strength tests for concrete pipe as required in applicable specifications shall be the three-edge bearing tests.

5. PIPE FOR CULVERTS shall be as indicated and shall conform to requirements for the following pertinent types.

5.1 Reinforced Concrete Pipe. ASTM C 76 or AASHTO M 170, Class IV.

5.2 Corrugated Steel Pipe and Pipe Arch. Fed. Spec. WW-P-405, Class I or II, Shape 1, 2, and 3 as applicable. Sheet thickness and corrugation of pipe or pipe arch shall be as indicated.

6. DRAINAGE STRUCTURES shall be of the following types, constructed of the materials specified for each type and in accordance with the indicated details.

6.1 Walls and Headwalls. Construction shall be of reinforced concrete as indicated.

6.2 Flared End Sections. Sections shall be of a standard design with pipe manufacturer and manufactured of the same material as specified for the pipe.

7. MATERIALS FOR DRAINAGE STRUCTURES.

7.1 Concrete. Unless otherwise specified, reinforced concrete shall conform to the requirements of the section: CONCRETE CONSTRUCTION. 7.2 Mortar. Mortar for pipe joints and connections to other drainage structures shall conform to ASTM C 270, Type M, except the maximum placement time shall be one hour.

7.2.1 The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar. Water shall be clean and free of harmful acids, alkalies, and organic impurities. The mortar shall be used within 30 minutes after the ingredients are mixed with water.

7.2.2 The inside of the joint shall be wiped clean and finished smooth. In pipe too small for a man to work inside, wiping may be done by dragging a suitable swab or long-handled brush through the pipe as work progresses. The mortar bead on the outside shall be protected from air and sun with a proper covering until satisfactorily cured.

8. CONCRETE PIPE JOINTS. Unless otherwise specified, one of the following methods of jointing for bell-and-spigot and tongue-and-groove pipe shall be used:

8.1 Cement-Mortar Bell-And-Spigot Joint. The first pipe shall be bedded to the established gradeline, with the bell end placed upstream. The interior surface of the bell shall be carefully cleaned with a wet brush and the lower portion of the bell filled with mortar to such depth as to bring inner surfaces of abutting pipes flush and even. The spigot end of each subsequent pipe shall be cleaned with a wet brush and uniformly matched into the bell so that sections are closely fitted. After each section is laid, remainder of the joint shall be filled with mortar, and a bead shall be formed around the outside of the joint with sufficient additional mortar. Cement mortar, finish, and protection of joints shall be as specified in paragraph MATERIALS FOR DRAINAGE STRUCTURES: Mortar. If mortar is not sufficiently stiff to prevent appreciable slump before setting, outside of the joint shall be wrapped or bandaged with cheesecloth to hold mortar in place.

8.2 Cement-Mortar Oakum Joint for Bell-And-Spigot Pipe. A closely twisted gasket shall be made of joint packing, conforming to Fed. Spec. HH-P-117, of diameter required to support the spigot end of the pipe at the proper grade and to make the joint concentric. Joint packing shall be in one piece of sufficient length to pass around the pipe and lap at top. This gasket shall be thoroughly saturated with neat cement grout. Bell of the pipe shall be thoroughly cleaned with wet brush, and gasket shall be laid in the bell for the lower third of the circumference and covered with mortar. Spigot of pipe shall be thoroughly cleaned with wet brush, inserted in the bell, and carefully driven home. A small amount of mortar shall be inserted in the annular space for the upper two-thirds of the circumference. The gasket then shall be lapped at top of the pipe and driven home in the annular space with calking tool. Remainder of annular space then shall be filled completely with mortar and beveled at an angle of approximately 45 degrees with outside of the bell. If mortar is not sufficiently stiff to prevent appreciable slump before setting, outside of the joint thus made shall be wrapped with cheesecloth. Placing of this type joint shall be kept at least five joints behind laying operations. The cement mortar finish, and protection of joints shall be as specified in paragraph MATERIALS FOR DRAINAGE STRUCTURES: Mortar.

8.3 Cement-Mortar Diaper Joint for Bell-And-Spigot Pipe. The pipe shall be centered so that annular space is uniform. The annular space shall be calked with joint packing conforming to Fed. Spec. HH-P-117. Before calking, the inside of bell and outside of spigot shall be clean.

8.3.1 Diaper bands shall consist of heavy cloth fabric to hold grout in place at joints and shall be cut into such lengths that they will extend one-eighth of the circumference of pipe above the spring line on one side of pipe and up to the spring line on the other side of the pipe. Longitudinal edges of fabric bands shall be rolled and stitched around two pieces of wire. Width of fabric bands shall be such that after fabric has been securely stitched around both edges on wires, the wires will be uniformly spaced not less than eight inches apart. Wires shall be cut into lengths to pass around pipe with sufficient extra length for the ends to be twisted at top of pipe to hold band securely in place; bands shall be accurately centered around lower portion of joint.

8.3.2 Grout shall be poured between band and pipe from only the high side of band, until grout rises to the top of band at the spring line of pipe, or as nearly so as possible, on the opposite side of pipe, to insure a thorough sealing of joint around the portion of pipe covered by band. Silt, slush, water, or polluted mortar grout forced up on the lower side shall be carefully forced out by the pouring and removed.

8.3.3 The remaining unfilled upper portion of the joint shall then be filled with mortar and a bead formed around outside of this upper portion of joint with sufficient amount of additional mortar. The diaper shall be left in place. Placing of this type joint shall be kept at least five joints behind actual laying of pipe. No backfilling around joints shall be done until joints have been fully inspected and approved. The cement mortar, finish, and protection of joints shall be as specified in paragraph MATERIALS FOR DRAINAGE STRUCTURES: Mortar.

8.4 Cement-Mortar Tongue-And-Groove Joint. The first pipe shall be bedded carefully to the established gradeline with the groove upstream. A shallow excavation shall be made underneath the pipe at the joint and filled with mortar to provide a bed for the pipe. The grooved end of the first pipe shall be carefully cleaned with a wet brush, and a layer of soft mortar applied to the lower half of the groove. The tongue of the second pipe shall be cleaned carefully with a wet brush; while in horizontal position, a layer of soft mortar shall be applied to the upper half of the tongue. The tongue end of the second pipe then shall be inserted in the grooved end of the first pipe until mortar is squeezed out on interior and exterior surfaces. Sufficient mortar shall be used to fill the joint completely and to form a bead on the outside. The cement mortar, finish, and protection of joints shall be as specified in paragraph MATERIALS FOR DRAINAGE STRUCTURES: Mortar.

8.5 Cement-Mortar Diaper Joint for Tongue-And-Groove Pipe. The joint shall be of the type described in paragraph: Cement-Mortar Tongue-And-Groove Joint below, except that the shallow excavation directly beneath the joint shall not be filled with mortar until after a gauze or cheesecloth band dipped in cement mortar has been wrapped around the outside of the joint. The cement-mortar bead at the joint shall be at least 1/2 inch thick, and the width of the diaper band shall be at least eight inches. The diaper shall be left in place. Placing of this type joint shall be kept at least five joints behind the actual laying of the pipe. No backfilling around the joints shall be done until joints have been fully inspected and approved. The cement mortar, finish, and protection of joints shall be as specified in paragraph MATERIALS FOR DRAINAGE STRUCTURES: Mortar.

8.6 Prefabricated Plastic Sealing Compound Joint For Tongue-and-Groove Pipe.

8.6.1 Materials. Design of joints and physical requirements for preformed plastic sealing compound shall conform to Fed. Spec. SS-S-210.

8.6.2 Installation. Sealing compounds shall follow the recommendation of the particular manufacturer in regard to special installation requirements. Surfaces to receive lubricants, primers, or adhesives shall be dry and clean. Sealing compounds shall be affixed to the pipe not more than three hours prior to installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Sealing compounds shall be inspected before installation of the pipe, and any loose or improperly affixed sealing compound shall be removed and replaced. The pipe shall be alined with the previously installed pipe, and the joint pulled together. If, while making the joint, a slight protrusion of the material is not visible along the entire inner and outer circumference of joint when joint is pulled up, pipe shall be removed and joint remade. After joint is made, all inner protrusions shall be cut off flush with the inner surface of pipe.

9. CORRUGATED METAL PIPE JOINTS. Space between pipe and connecting bands shall be kept free from dirt and grit so that corrugations fit snugly. The connecting band, while being tightened, shall be tapped with a soft-head mallet of wood, rubber, or plastic to take up slack and insure a tight joint.

9.1 Standard Field Joints. Unless otherwise specified, field joints shall be made with outside bands, each band consisting of one or two pieces. The type, size, and gage of band and the size of angles and bolts shall be as specified in the applicable standards or specifications for the pipe.

10. EXCAVATION AND TRENCHING FOR PIPE CULVERTS. Excavation of trenches and backfilling for culverts shall be in accordance with the applicable portions of section(s): EXCAVATION and FILLS AND SUBGRADE PREPARATION and the following requirements.

10.1 Trenching. Width of trenches at any point below the top of the pipe shall be not greater than the outside diameter of the pipe plus 24 inches to permit satisfactory jointing and thorough tamping of the bedding material under and around pipe. Sheeting and bracing where required shall be placed within the trench width as specified. Care shall be takj n not to overexcavate. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures shall be necessary. Cost of this redesign and increased cost of pipe or installation shall be borne by the Contractor without additional cost to the Government.

10.2 Removal of Rock. Rock in either ledge or boulder formation shall be replaced with selected materials to provide a compacted earth cushion having a thickness between unremoved rock and the pipe of at least eight inches or one-half inch for each foot of fill over the top of the pipe, whichever is greater, but not more than three-fourths the nominal diameter of the pipe. Where bell-and-spigot pipe is used, the cushion shall be maintained under the bell as well as under the straight portion of the pipe.

10.3 Removal of Unstable Material. Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Contracting Officer, is encountered in bottom of trench, such material shall be removed to depth required and replaced to the proper grade with selected material, compacted as provided in paragraph BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor in his performance of shoring and sheeting, water removal, or other specified requirements, resulting material shall be excavated and replaced.

11. BEDDING. The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe. The pipe shall be bedded carefully in a soil foundation accurately shaped and rounded to conform to the lowest one-fourth of the outside portion of circular pipe, or to the lower curved portion of pipe arch for the entire length of pipe or arch. When necessary, the bedding shall be tamped. Bell holes and depressions for joints shall be only of such length, depth, and width as required for properly making the particular type joint.

12. PLACING PIPE. Each pipe shall be carefully examined before being laid, and defective or damaged pipe shall not be used. Pipelines shall be laid to the grades and alinement indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Lifting lugs in vertically elongated metal pipe shall be placed in the same vertical plane as the major axis of the pipe. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. All pipe in place shall be inspected before backfilling, and those damaged during placement shall be removed and replaced at no additional cost to the Government.

12.1 Concrete Pipe. Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow.

12.2 Corrugated Metal Pipe and Pipe Arch. Laying shall be with the separate sections joined firmly together, with the outside laps of circumferential joints pointing upstream and with longitudinal laps on the sides. Any unprotected metal in the joints shall be coated with bituminous material specified in Fed. Spec. WW-P-405. Interior coating shall be protected against damage from insertion or removal of struts or tie wires. Lifting lugs, when used, shall be placed to facilitate moving pipe without damage to exterior or interior coatings. Prior to placing backfill, damaged areas of coupling bands and pipe shall be given a coating of bituminous material specified in Fed. Spec. WW-P-405.

13. BACKFILLING.

13.1 Backfilling Pipe in Trenches. After the bedding has been prepared and the pipe installed, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. Care shall be taken to insure thorough compaction of the fill under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation of at least 12 inches above the top of the pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling, or compacted by mechanical rammers or tampers in layers not exceeding 8 inches. Tests for density shall be made as necessary to insure conformance to the compaction requirements specified in "Compaction" below. Where it is necessary in the opinion of the Contracting Officer, any sheeting and/or portions of bracing used shall be left in place, and the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.

13.2 Backfilling Pipe in Fill Sections. For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified above and in "Compaction" below. The fill material shall be uniformly spread in layers longitudinally on both sides of pipe, not exceeding six inches in compacted depth, and shall be compacted by rolling parallel with pipe or by mechanical tamping or ramming. Prior to commencing normal filling operations, the crown width of the fill at a height of 12 inches above the top of the pipe shall extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 12 feet, whichever is less. After the backfill has reached at least 12 inches above the top of the pipe, the remainder of the fill shall be placed and throughly compacted in layers not exceeding 8 inches.

13.3 Movement of Construction Machinery. In compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall avoided. Movement of construction machinery over a culvert at any stage of the construction shall be at the Contractor's risk. Any pipe damaged thereby shall be repaired or replaced at the expense of the Contractor.

13.4 Compaction. Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.

13.4.1 Minimum Density. Backfill over and around pipe, and backfill around and adjacent to all other drainage structures shall be compacted at the approved moisture content to the following applicable minimum densities which will be determined as specified in section: FILLS AND SUBGRADE PREPARATION.

13.4.1.1 Under paved roads, parking areas, and similar-use pavements including adjacent shoulder areas. 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material, up to the elevation where requirements for pavement subgrade materials and compaction shall control.

13.4.1.2 Under unpaved or turfed traffic areas. 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material.

13.4.1.3 Under nontraffic areas. Density not less than that of surrounding material.

* * * * *

SECTION 8E

REINFORCED CONCRETE PIPE CONDUIT

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 American Society for Testing and Materials (ASTM) Publication.

C 76-75	Reinforced Concrete Culvert, Storm Drain and Sewer Pipe

2. GENERAL REQUIREMENTS.

2.1 General. The reinforced concrete pipe conduit shall be constructed as shown and as specified. Concrete shall conform to the applicable requirements of the section: CONCRETE CONSTRUCTION. Where pipe is embedded in concrete, the pipe shall be supported in such a manner to hold it rigidly in position while concrete is placed. Earthwork about the conduit shall conform to the applicable requirements of the sections: EXCAVATION, STRIPPING, and FILLS AND SUBGRADE PREPARATION. Specified and/or indicated D-loading is the minimum acceptable, and heavier pipe may be furnished at the option of the Contractor.

2.2 Tests for Pipe. Certified copies of test reports, demonstrating conformance to the applicable pipe specifications, shall be furnished the Contracting Officer before installation of the pipe. Strength tests for concrete pipe, as required in the applicable specifications, shall be the three-edge bearing tests.

3. CONCRETE PIPE.

3.1 Materials.

3.1.1 Reinforced Concrete Pipe shall conform to the requirements of ASTM Specification C 76, strength as indicated. The following additional markings shall be clearly stenciled on the pipe:

Permissible D-load to produce a 0.01-inch crack
Internal diameter in inches

3.1.2 Mortar.

3.1.2.1 Composition. Mortar for joints shall be composed of cement, sand, and water proportioned at the approximate ratio of one part cement to not more than two parts sand. The materials shall conform to the applicable requirements of the section: CONCRETE CONSTRUCTION.

3.1.2.2 Mixing. The mortar shall be mixed in a concrete mixer in the manner specified for concrete, or in a watertight mixing box. If mixed in a box, the box shall first be filled with the required amount of sand, the volume of which shall be determined with a one-cubic-foot measuring box. The requisite amount of cement shall then be added and the material dry mixed by turning at least three times with a mortar hoe. Sufficient water shall then be added and the mixing continued until the batch is uniform in color and consistency. Mortar shall show no visible signs of setting and shall be used within a period of 30 minutes after mixing with water. No retempering will be permitted.

3.2 Installation.

3.2.1 Placing. Each pipe shall be carefully examined before being laid, and defective or damaged pipe shall not be used. Pipelines shall be laid to the grades and alinement indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. All pipe in place shall have been inspected before encasing in concrete. Laying shall proceed upgrade with the tongue ends of tongue-and-groove pipe pointing in the direction of the flow. Circular concrete pipe with elliptical reinforcing shall be so placed that the reference lines designating the top of the pipes will be not more than 5 degrees from the vertical plane through the longitudinal axis of the pipe. In encasing the pipe in concrete, care shall be taken to prevent damage to or misalinement of the pipe.

3.2.2 Mortar Joints. All joint areas shall be cleaned and moistened with a wet brush immediately before calking. The interior surface of the lower portion of the groove of the tongue-and-groove pipe shall have a layer of soft mortar applied. The tongue end of the second section, while in a horizontal position, shall have a layer of soft mortar applied to the upper half of the tongue. The tongue shall then be inserted in the groove. The joint shall then be calked with mortar, completely filling the annular space between the pipe sections. The inside of the joint shall then be wiped and finished smooth. The outside of the joint shall be immediately protected from the air and sun with continuously moist burlap or earth until the mortar is cured.

* * * * *

SECTION 9A

AGGREGATE BASE

Index

1. Applicable Publications
2. Materials
3. Sampling and Testing
4. Equipment
5. Operation of Pits or Quarries
6. Weather Limitations
7. Preparation of Underlying Surface
8. Grade Control
9. Mixing and Placing Materials
10. Layer Thickness
11. Compaction
12. Edges of Base Course
13. Smoothness Test
14. Thickness Control
15. Maintenance
16. Waybills and Delivery Tickets

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 American Society for Testing and Materials (ASTM) Publications.

C 117-69 (1974)	Materials Finer than No. 200 (75-m) Sieve in Mineral Aggregates by Washing
C 127-73	Specific Gravity and Absorption of Coarse Aggregate
C 128-73	Specific Gravity and Absorption of Fine Aggregate
C 131-69	Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine
C 136-71	Sieve or Screen Analysis of Fine and Coarse Aggregates
D 75-71	Sampling Aggregates
D 422-63 (1972)	Particle-Size Analysis of Soils
D 423-66 (1972)	Liquid Limit of Soils
D 424-59 (1971)	Plastic Limit and Plasticity Index of Soils
D 1556-64 (1974)	Density of Soil In Place by the Sand-Cone Method
D 1557-70	Moisture-Density Relations of Soils, Using 10-lb. (4.5-kg) Rammer and 18-in. (457-mm) Drop
E 11-70	Wire-Cloth Sieves for Testing Purposes

2. MATERIALS. Aggregates shall consist of crushed stone, crushed gravel, angular sand, soil, or other sound, durable approved materials processed and blended or naturally combined. Aggregates shall be durable and sound, free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material. It shall be the responsibility of the Contractor to obtain materials that will meet the requirements specified herein and that can be constructed to meet the grade and smoothness requirements specified herein after all compaction requirements have been completed. The material retained on a No. 4 sieve shall be known as coarse aggregate, and the material passing the No. 4 sieve shall be known as binder material.

2.1 Coarse Aggregate conforming to the requirements specified above shall have a percentage of wear not to exceed 50 percent after 500 revolutions. Coarse aggregate shall consist of angular fragments reasonably uniform in density and quality. The amount of flat and elongated particles shall not exceed 30 percent. A flat particle is one having a ratio of width to thickness greater than 3, and an elongated particle is one having a ratio of length to width greater than 3.

2.1.2 Coarse aggregate retained on each sieve specified shall contain at least 50 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the piece. When two fractures are adjacent, the angle between the planes of the fractures must be at least 30 degrees to count as two fractured faces.

2.2 Binder Material shall consist of screenings, angular sand, soil, or other finely divided mineral matter processed or naturally combined with the coarse aggregate. Liquid-limit and plasticity-index requirements stated herein shall apply to any component that is blended to meet the required gradation and shall also apply to the completed course. The portion of any component or of the completed course passing the No. 40 sieve shall be either nonplastic or shall have a liquid limit not greater than 25 and a plasticity index not greater than 5.

2.3 Gradation requirements specified herein shall apply to the completed base course, and it shall be the responsibility of the Contractor to obtain materials that will meet the gradation requirements after mixing, placing, compacting, and other operations. The aggregates shall have a maximum size of one inch and shall be continuously graded within the limits specified below:

Sieve Designation	Percentage by Weight Passing Square-Mesh Sieve†
1-1/8 inch	100
1/4 inch	38-70
No. 200	3-12

In addition to the above requirements, all material used shall conform to the following gradation relationships:

(A) Of that fraction of the material passing the 1/4 inch sieve, 58 to 100 percent shall pass the No. 8 sieve.

(B) Of that fraction of the material passing the No. 8 sieve, 28 to 70 percent shall pass the No. 30 sieve.

(C) Of that fraction of the material passing the No. 8 sieve, 8 to 23 percent shall pass the No. 200 sieve.

(D) Of that fraction of the material passing the No. 30 sieve, 14 to 45 percent shall pass the No. 200 sieve.

† The values are based on aggregates of uniform specific gravity, and the percentages passing the various sieves are subject to appropriate correction by the Contracting Officer when aggregates of varying specific gravities are used.

3. SAMPLING AND TESTING shall be by and at the expense of the Contractor.

3.1 Samples shall be the size required and shall be taken by the Contractor. Copies of test results shall be submitted for approval 14 days prior to starting the work, and thereafter at regular intervals during production as specified hereinafter. These samples shall be obtained at the source, from test pits, borings, trucks, stockpiles, or from other designated locations. Samples for material gradation, liquid-limit determination, and plasticity-index tests shall be taken in conformance with ASTM D 75. After the material has been placed and compacted, samples for density tests shall be taken as specified in ASTM D 1556, and additional samples for gradation, liquid-limit, and plasticity-index tests shall be taken by an appropriate method. Where deemed necessary, the sampling will be supervised by the Contracting Officer. The Contractor shall arrange his work so that sampling and testing may be performed without interruption.

3.2 Tests.

3.2.1 Aggregate Gradation. Aggregate gradation shall be determined in accordance with ASTM C 117, C 127, C 128, C 136, and D 422. Sieves shall conform to ASTM E 11.

3.2.2 Liquid Limit shall be determined in accordance with ASTM D 423.

3.2.3 Plasticity Index shall be determined in accordance with ASTM D 424.

3.2.4 Wear Test shall be made in conformance with ASTM C 131.

3.2.5 Field-In Place Density shall be determined in accordance with ASTM D 1556. Moisture-density relations shall be established in the laboratory in accordance with ASTM D 1557, method D.

3.3 Testing Frequency. Results of tests to determine particle shape, presence of objectionable coatings and foreign matter, percentage of wear, fracture count, gradation, liquid-limit, plasticity-index, specific gravity, and other specification requirements for determination of the acceptability of the source shall be submitted for approval at least 7 days prior to starting of manufacture of the base course material. Production testing for material gradation, liquid limit, and plasticity index shall be performed at regular intervals with at least one test being made for each 500 cubic yards or fraction thereof, of material produced and results shall be submitted on a daily basis. Deviations from specification requirements shall be corrected immediately upon discovery. After the material has been placed and compacted, one field density test for each 1,000 square yards or fraction thereof of finished base course and one additional gradation, liquid-limit, and plasticity index test for each 3,000 square yards of base course or fraction thereof shall be performed. Maximum-density moisture relations shall be established for each 6,000 square yards of base course material. The location of the after-placement tests shall be as directed. One copy of density data less dry weight determinations shall be provided on the day each test is taken. The completed test report shall be provided with the Contractor Quality Control Report on the following work day. Results of all tests made shall be submitted for approval on a daily basis and subsequent paving operations shall not commence until final approval has been obtained. Failure of any test shall be reported verbally, by the most expeditious means and followed promptly by written report. Contractor field operations shall immediately reflect corrective measures. For every failing test, retesting after completion of corrective measures have been taken will be required.

3.4 Approval of Material. The source of the material shall be selected 14 days in advance of the time materials will be required in the work. Tentative approval of the preliminary reports submitted by the Contractor and the source will be based on an inspection by the Contracting Officer. Tentative approval of the materials will be based on test samples as specified herein. Final approval of both the source and the materials will be based on specified tests performed on samples taken from the completed and compacted base course.

4. EQUIPMENT. All plant equipment and tools used in the performance of the work covered by this section will be subject to approval by the Contracting Officer before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and have the capability of producing the required compaction, meeting grade controls, thickness controls, and smoothness requirements as set forth herein and within the specified time limits.

5. OPERATION OF PITS OR QUARRIES. All work involved in clearing, stripping, and excavating in opening or operation of pits or quarries shall be performed by the Contractor. Pits or quarries shall be opened so as to expose the vertical faces of the deposit to depths suitable for working. Materials excavated from pits shall be obtained in successive vertical cuts extending through all exposed strata. All pockets or strata of unsuitable materials overlying or occurring within the deposit shall be wasted as directed. The methods of operating the pits or quarries and the processing and blending of the material may be changed or modified by the Contracting Officer when necessary to obtain material conforming to the specified requirements. Quarries shall be conditioned in agreement with the local laws or authorities.

6. WEATHER LIMITATIONS. Aggregate base courses shall not be constructed when the atmospheric temperature is below 35 degrees F. When the temperature falls below 35 degrees F., the Contractor shall protect all areas of the completed aggregate base course against any detrimental effects of freezing. Areas of completed aggregate base course damaged by freezing, rainfall, or other weather conditions shall be corrected to meet specified requirements.

7. PREPARATION OF UNDERLYING SURFACE. Prior to constructing the aggregate base course, the previously constructed subgrade shall be cleaned of all foreign substances. The surface of the subgrade shall be inspected by the Contractor for adequate compaction and surface tolerances. The subgrade shall conform to section: FILLS AND SUBGRADE PREPARATION. Ruts or soft, yielding spots that may appear in the subgrade areas having inadequate compaction, and deviations of the surface from the requirements set forth therein shall be corrected to line and grade and to all specification requirements. The finished subgrade shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the base course is placed.

8. GRADE CONTROL. During construction the lines and grades including crown and cross slope indicated for the aggregate base course shall be maintained by means of line and grade stakes placed by the Contractor at the worksite in accordance with SPECIAL PROVISIONS of these specifications.

9. MIXING AND PLACING MATERIALS. The materials shall be mixed by the stationary-plant, traveling-plant or road-mix method and placed in such a manner as to obtain uniformity of the aggregate base course material and at a uniform optimum moisture content for compaction. The Contractor shall make such adjustments in mixing or placing procedures or in equipment as may be directed to obtain the true grades, to minimize segregation and degradation, to reduce to accelerate loss or increase of water, and to insure a satisfactory aggregate base course meeting all the requirements of this specification.

10. LAYER THICKNESS. The compacted thickness of the aggregate base course shall be as indicated. When a compacted layer of 6 inches is indicated, the material may be placed in a single layer. When a compacted layer thickness of more than 6 inches is indicated, the material shall be placed in two layers of approximately equal thickness.

11. COMPACTION. Each layer of the aggregate base course including shoulders shall be compacted with approved compaction equipment. Water content shall be maintained at optimum or at the percentage specified during compaction. In places not accessible to the rollers, the mixture shall be compacted with mechanical tampers. Compaction shall continue until each layer through the full depth is compacted to at least 100 percent of maximum density. The Contractor shall make such adjustments in rolling or finishing procedures as may be required to obtain true grades, to minimize segregation and degradation, to reduce or accelerate loss or gain of water, and to insure a satisfactory aggregate base course. Unsatisfactory materials shall be reworked to produce a satisfactory material.

12. EDGES OF BASE COURSE. Where the course is not placed between curbs or similar construction, approved material shall be placed along the edges of the aggregate base course in such quantities as will compact to the thickness of the course being considered, or, when the course is being constructed in two layers, to the thickness of each layer of the course, allowing in each operation at least a 1-foot width of the shoulder to be rolled and compacted simultaneously with the rolling and compacting of each layer of the base course, as directed.

13. SMOOTHNESS TEST. The surface of each layer shall not show any deviations in excess of 3/8 inch when tested with either a 10- or 12-foot straightedge applied both parallel with and at right angles to the centerline of the paved area. Any deviation in excess of this amount shall be corrected by the Contractor by removing material and replacing with new material, or by reworking existing material and compacting, as directed.

14. THICKNESS CONTROL. The completed thicknesses of the base course shall be within 1/2 inch, plus or minus, of the thickness indicated. Thickness test shall be made and recorded by the Contractor. The thickness of the base course shall be measured at intervals in such manner that there will be a thickness measurement for at least each 500 square yards of base course. The thickness measurement shall be made by test holes at least 3 inches in diameter through the base course. Where the measured thickness of the base course is more than 1/2 inch deficient in thickness, the Contractor, at no additional expense to the Government, shall correct such areas by scarifying, adding mixture of proper gradation, reblading, and recompacting, as directed. Where the measured thickness of the base course is more than 1/2 inch thicker than that indicated, it shall be considered as conforming with the specified thickness requirements plus 1/2 inch. The average job thickness shall be the average of the job measurements determined as specified above, but shall be within 1/4 inch of the thickness indicated.

15. MAINTENANCE. The Contractor shall maintain the aggregate base course in a satisfactory condition until the completed work is accepted.

16. WAYBILLS AND DELIVERY TICKETS. Copies of waybills or delivery tickets shall be attached to the Daily Contractor Quality Control Report for the day of delivery. Before the final statement is allowed, the Contractor shall file with the Contracting Officer waybills and/or certified delivery tickets for all aggregates actually used in the construction covered by the contract.

* * * * *

SECTION 9D

PRIME COAT

Index

1. Applicable Publications
2. Bituminous Materials
3. Sampling and Testing
4. Quantity To Be Applied
5. Weather Limitations
6. Equipment
7. Preparation of Surface
8. Application of Bituminous Material
9. Waybills and Delivery Tickets

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 American Society for Testing and Materials (ASTM) Publications.

D 140-70	Sampling Bituminous Materials
D 1250-56 (1973)	Petroleum Measurement Tables
D 2027-72	Liquid Asphalt (Medium-Curing Type)

1.2 American Association of State Highway and Transportation Officials (AASHTO) Standard.

T 102-74	Spot Test of Asphaltic Materials

2. BITUMINOUS MATERIAL. The bituminous material prime coat shall be liquid asphalt, conforming to ASTM D 2027, designation MC-70, with the additional requirement that the residue from distillation to 680 degrees F. shall show a negative spot test when submitted to AASHTO T 102, using the standard naphtha specified therein.

3. SAMPLING AND TESTING.

3.2 Sampling. Samples of bituminous material, unless otherwise specified, shall be in accordance with ASTM D 140.

3.2 Testing shall be the responsibility of the Contractor. Testing shall be performed by an acceptable commercial testing laboratory or by the Contractor on approval of the Contracting Officer. Materials shall be tested to establish compliance with the specified requirements.

3.3 Certified Laboratory Test Reports: Before delivery of bituminous materials, certified copies, in triplicate, of the tests specified herein and in referenced publications shall be submitted to and approved by the Contracting Officer. The testing shall have been performed by an independent laboratory approved by the Contracting Officer.

4. QUANTITY TO BE APPLIED. Bituminous material for the prime coat shall be applied in quantities of not less than 0.15 gallon nor more than 0.4 gallon per square yard of the surface to be primed. Application of prime coat shall be divided, if necessary, into 2 applications to avoid flowing off the surface. The exact quantities which may be varied to meet field conditions shall be determined by the Contractor and approved.

5. WEATHER LIMITATIONS. The prime coat shall be applied only when the prepared surface is dry or contains moisture not exceeding quantity to permit uniform distribution and desired penetrations; and the temperature has not been below 35 degrees F. for 12 hours immediately prior to application. Prime coat shall not be applied when the atmospheric temperature in the shade is below 50 degrees F.

6. EQUIPMENT.

6.1 General. All equipment, tools, and machines, used in the performance of the work required by this section shall be subject to the approval of the Contracting Officer, and shall be maintained in satisfactory working condition.

6.2 Bituminous Distributor shall have pneumatic tires of such width and number that the load produced on the base surface shall not exceed 650 pounds per inch of tire width. The distributor shall be designed and equipped to distribute the bituminous material uniformly, at even heat, on variable widths of surface, at readily determined and controlled rates from 0.05 to 2.0 gallons per square yard, with a pressure range of 25 to 75 pounds per square inch, and with an allowable variation not to exceed 5% from any specified rate. Distributor equipment shall include a separate power unit for the bitumen pump, full circulation spray bars, tachometer, pressure gages, volume measuring devices, adequate heaters for heating the materials to the proper application temperature, a thermometer to show the temperature of the tank contents, and a hose attachment suitable for applying bituminous material to areas unavoidably missed by the distributor. The distributor shall be equipped to circulate and agitate the bituminous material during the heating process.

6.3 Heating Equipment for Storage Tanks. Equipment for heating bituminous material shall consist of steam coils and equipment for producing steam, so designed that steam will not enter the material. If storage tanks are to be used, an armored thermometer with a range from 40 to 200 degrees F. shall be affixed to the tank so that the temperature of the bituminous material may be read at all times.

6.4 Brooms and Blowers shall be of the power type and shall be suitable for cleaning prepared surfaces.

7. PREPARATION OF SURFACE. Immediately before applying the prime coat, all loose material, dirt, clay and other objectionable substance shall be removed from the surface to be primed, by means of a power broom or blower supplemented by hand brooms. After the cleaning operation and prior to the application of the prime coat, an inspection of the area to be coated shall be made by the Contractor to determine its fitness to receive the bituminous material. The Contracting Officer shall be notified at least 24 hours in advance of the application of the bituminous material. To assure a uniform spread of the bituminous material, the areas prepared for treatment, if excessively dry, shall be lightly sprinkled with water immediately before the application as directed.

8. APPLICATION OF BITUMINOUS MATERIAL. Immediately following the preparation of the surface, the bituminous material shall be applied by means of a bituminous distributor. The bituminous material shall be applied at a pressure within the range of 25 to 75 pounds per square inch and in the amounts as directed. The bituminous material shall be so applied that uniform distribution is obtained at all points of the surface to be treated. Unless the distributor is equipped to obtain satisfactory results at the junction of the previous and subsequent applications, building paper shall be spread on the surface of applied material for a sufficient distance back from the ends of each application so that flow from the sprays may be started and stopped on the paper, and all sprayers operate at full force on the surface to be treated. Immediately after the application, building paper shall be removed and destroyed. Spots unavoidably missed by the distributor shall be properly treated with bituminous material. Following the application of bituminous material, the surface shall be allowed to dry without being disturbed for a period of not less than 48 hours, or longer as necessary to attain penetration into the foundation course and evaporation of the volatiles from prime material. The Contractor shall furnish and spread enough approved sand to effectively blot and cure any excess bituminous material. The Contractor shall maintain the primed surface until the succeeding layer of pavement is placed, by protecting the surface against damage and by repairing and repriming deficient areas at no additional cost to the Government. No smoking, fires, nor flames, other than the heaters which are a part of the equipment, shall be permitted within heating, distributing, or transferring operations of bituminous material.

8.1 Application Temperature. Shall be as directed and shall provide an application viscosity between 40 and 120 centistrokes, kinematic, or 20 and 60 seconds, Saybolt-Furol. Application temperatures shall be within the range of 120-190 degrees F., except that appropriate changes should be made when the range of viscosity is raised or lowered. The temperature-viscosity relationship shall be furnished to the Contracting Officer.

10. WAYBILLS AND DELIVERY TICKETS. Copies of waybills or delivery tickets shall be submitted during the progress of the work. Before the final statement is allowed, the Contractor shall file with the Contracting Officer certified waybills and/or certified delivery tickets for all bituminous material actually used in the construction of pavement covered by this section of the specification. The Contractor shall not remove bituminous material from the tank car or storage tank until the initial outage and temperature measurements have been taken by the Contracting Officer; nor shall the Contractor release the car or storage tank until the final outage has been taken by the Contracting Officer.

* * * * *

SECTION 9G

ASPHALT CONCRETE

Index

1. Applicable Publications
2. Description
3. Aggregates
4. Bituminous Material
5. Aggregate Gradation
6. Composition of Mixture
7. Mixing Plant
8. Other Equipment
9. Treatment of Underlying Surface
10. Transportation of Bituminous Mixture
11. Placing
12. Compaction of Mixture
13. Joints
14. Protection of Pavement
15. Surface Requirements
16. Sampling

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 American Association of State Highway and Transportation Officials (AASHTO) Standard.

M 226-731	Viscosity Graded Asphalt Cement

1.2 American Society for Testing and Materials (ASTM) Publications.

C 117-69 (1974)	Materials Finer Than No. 200 (75 um) Sieve in Mineral Aggregates by Washing
C 127-73	Specific Gravity and Absorption of Coarse Aggregate
C 128-73	Specific Gravity and Absorption of Fine Aggregate
C 136-71	Sieve or Screen Analysis of Fine and Coarse Aggregates
D 242-70	Mineral Filler for Bituminous Paving Mixtures
D 1559-75	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
D 977-73	Emulsified Asphalt

1.3 Military Standard.

MIL-STD-620A & Notice 1	Test Methods for Bituminous Paving Materials

2. DESCRIPTION. Asphalt concrete indicated as "A.C." shall consist of fine and coarse aggregates and mineral filler, if required, uniformly mixed with hot bituminous material, and placed and compacted on a prepared base course.

3. AGGREGATES shall consist of crushed stone, crushed slag, crushed or uncrushed gravel, screenings, sand, and mineral filler. Aggregates shall have a satisfactory service record in bituminous pavement construction. The source selected shall be approved by the Contracting Officer. Material passing the No. 200 sieve shall be known as mineral filler. Mineral filler shall conform to ASTM D 242. The combined aggregates and mineral filler shall meet the requirements of subsequent paragraphs entitled AGGREGATE GRADATION and COMPOSITION OF MIXTURE.

4. BITUMINOUS MATERIAL to be mixed with the mineral aggregates shall be asphalt cement conforming to AASHTO M226, viscosity grade AR-40 Table 3.

5. AGGREGATE GRADATION. The aggregate gradation as determined by ASTM C 117 and C 136 and as selected by the Contracting Officer shall conform to one of the following:

Sieve Openings	Percentage by Weight, Passing a	b
1 inch	100	–
3/4 inch	90-100	100
1/2 inch	–	90-100
3/8 inch	70-85	80-95
No. 4	50-65	55-72
No. 8	38-53	40-55
No. 50	12-26	14-27
No. 200	4-8	4-8

6. COMPOSITION OF MIXTURE.

6.1 Job-Mix Formula shall be submitted to the Contracting Officer for approval, and no bituminous mixture shall be manufactured until it has been approved. The formula will indicate the percentage of each sieve fraction of aggregate, percentage of asphalt, and temperature of the mixture as discharged from the mixer. The percentage of asphalt in the job-mix formula will be between 6.0 percent and 7.0 percent. The percentage of asphalt for bituminous curbs and ditch lining shall be between 7.0 and 8.0 percent. Samples of the aggregates and asphalt shall be submitted for approval with the job-mix formula.

6.2 Test Properties of Bituminous Mixtures. The apparent specific gravity, as determined by ASTM C 127 and C 128, shall be used in computing the voids total mix and voids filled with bitumen, and the mixture shall meet the following requirements as determined by ASTM D 1559:

Test Property	50-Blow Compaction
Stability, minimum, pounds	500
Flow, maximum, 1/100-inch	20
Voids total mix, percent	3-5
Voids filled with bitumen, percent	75-85
Retained stability, minimum	75

6.3 Stripping of Aggregates. If the index of retained stability of the job-mix formula is less than 75 when tested in accordance with Method 104 of MIL-STD-620, the aggregates shall be rejected or treated by one of the following procedures:

(1) Addition of heat-stable additives to bitumen.

(2) Addition of hydrated lime, or other cementitious material containing free lime, as a portion of the mineral filler.

7. MIXING PLANT shall be a weigh-batch or continuous-mix type approved by the Contracting Officer and operated so as to produce a mixture within the job-mix formula.

8. OTHER EQUIPMENT.

8.1 Bituminous-Materials Spreaders shall be self-propelled, capable of producing a finished surface conforming to the smoothness requirements specified hereinafter. The use of a spreader that leaves indentations or other objectionable irregularities in the freshly-laid mix will not be permitted.

8.2 Blowers and Brooms shall be of the power type suitable for cleaning the surface to be paved.

8.3 Saw shall be of the power type, capable of rapidly cutting pavement and trimming joints and edges of pavement.

8.4 Small Tools available on the work shall consist of the following: rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heater for heating small tools, wood sandals and stilt sandals of standard type, and other small tools as may be required.

8.5 Steel-Wheel Rollers shall be self-propelled, 3-wheel (tricycle) and/or tandem type, weighing not less than 20,000 pounds each. The rollers shall have adjustable wheel scrapers, water tanks, and sprinkling apparatus to keep the wheels sufficiently wet to prevent the bituminous mixture from sticking to the wheels. Rollers shall be capable of reversing without backlash and shall be free from worn parts. Roller wheels shall not have flat or pitted areas or projections that will leave marks in the pavement.

8.6 Pneumatic-Tired Rollers shall be self-propelled and shall consist of two axles on which are mounted multiple pneumatic-tired wheels in such manner that the rear group of wheels will not follow in the tracks of the forward group but spaced to give essentially uniform coverage with each pass. Axles shall be mounted in a rigid frame provided with a loading platform or body suitable for ballast loading. Tires shall be smooth and capable of being inflated to at least 90 p.s.i. Construction of roller shall be such that each wheel can be loaded to a minimum of 4,500 pounds.

9. TREATMENT OF UNDERLYING SURFACE. Prior to laying a bituminous course, the underlying surface shall be cleaned of loose and foreign matter by sweeping with power sweepers, power brooms, and hand brooms, as directed. The surface of the subgrade and aggregate base shall receive a prime coat conforming to the requirements of the section: PRIME COAT prior to placing the asphalt paving.

10. TRANSPORTATION OF BITUMINOUS MIXTURE. The bituminous mixture shall be transported from the mixing plant to the site in trucks having tight, clean, smooth bodies with a minimum coating of concentrated solution of hydrated lime and water to prevent adhesion of the mixture. Each load of mixture shall be covered with canvas or other suitable material to protect the mixture from the weather and to prevent loss of heat. Mixtures having temperatures greater than 350 degrees, mixtures having temperatures less than 235 degrees, or mixtures which form or show indications of moisture will be rejected. Hauling over freshly laid material will not be permitted.

11. PLACING.

11.1 Surface Preparation of Underlying Course. Prior to placing of asphalt surface course, the underlying course shall be cleared of all foreign or objectionable matter with power blowers, power brooms, or hand brooms.

11.2 Spraying of Contract Surfaces of Structures. Contact surfaces of previously constructed pavement, curbs, manholes, and similar structures shall be sprayed with a tack coat. Tack coat shall be asphalt emulsion conforming to ASTM D 977, Grade SS-1h.

11.3 General Requirements for Use of Mechanical Spreader. Range of temperatures of the mixtures, when dumped into the mechanical spreader shall be as determined by the Contracting Officer. Asphalt mixtures having temperatures less than 200 degrees F. when dumped into a mechanical spreader will be rejected. The mechanical spreader shall be adjusted and speed regulated so that surface of the course will be smooth and continuous without tears and pulling, and of such depth that, when compacted, surface will conform with cross section, grade, and contour indicated. Unless otherwise directed, placing shall begin along the centerline of areas paved on a crowned section of on the high side of areas with a one-way slope, and shall be in the direction of the major traffic flow. Mixture shall be placed in consecutive adjacent strips having a minimum width of 10 feet, except when edge lanes require strips less than 10 feet to complete area. Each strip placed before a succeeding strip shall be of such length that sufficient heat will be retained to make strip readily compactible so that joint can be obtained to conform to requirements for texture, density, and smoothness specified in paragraph: JOINTS. Length of a strip that is to be followed by another strip will be determined by the Contracting Officer, and may be decreased or increased as required by air temperatures, wind, and other climatic conditions existing at time of placement. Longitudinal joints and edges shall be constructed to true line markings. The Contractor shall establish lines parallel to the centerline of area to be paved and shall place stringlines coinciding with established lines for spreading machine to follow. Number and location of lines shall be as directed. Placing of mixture shall be as nearly continuous as possible; speed of placing shall be adjusted, as directed, to permit proper rolling.

11.4 Special Requirements for Placing Strips Succeeding Initial Strips. In placing each succeeding strip after the initial strip has been spread and compacted as specified below, screed of the mechanical spreader shall overlap previously placed strip 3 to 4 inches and shall be sufficiently high so that compaction will produce a smooth, dense joint. Mixture placed on edge of previously placed strip by mechanical spreader shall be pushed back to edge of strip being placed by use of lute. When the quantity of mixture on previously placed strip plus uncompacted material in strip being placed exceeds that required to produce smooth, dense joint, excess mixture shall be removed and wasted.

11.5 Shoveling, Raking, and Tamping After Machine Spreading. A sufficient number of experienced shovelers and rakers shall follow spreading machine, adding hot mixture and raking mixtures as required to produce a course that, when completed, will conform to all requirements specified herein. Broadcasting or fanning of mixture over areas being compacted will not be permitted. When segregation occurs in mixture during placing, the spreading operation shall be suspended until cause is determined and corrected. Irregularities in alinement of the course left by mechanical spreader shall be corrected by trimming directly behind machine. Immediately after trimming, edges of the course shall be thoroughly compacted by tamping laterally with lute. Distortion of course during tamping will not be permitted.

11.6 Hand Spreading in Lieu of Machine Spreading. In areas where use of machine spreading is impractical, mixture shall be spread by hand. Spreading shall be in a manner to prevent segregation. Mixture shall be spread uniformly with hot rakes in a loose layer of thickness that, when compacted, will conform to required grade and thickness. Rakers without stilt sandals shall not be permitted to stand in hot mixture while raking course.

12. COMPACTION OF MIXTURE shall be accomplished by steel-wheel and pneumatic tired rollers. Rolling shall begin as soon after placing as the mixture will support the roller without undue displacement. Rolling of the course shall be continued until all roller marks are eliminated and at least 95 percent of the density of a laboratory specimen of the same mixture has been obtained. The speed of the rollers at all times shall be slow enough to avoid displacement of the hot mixture. The wheels of the roller shall be moistened to prevent adhesion of the mixture. In areas not accessible to the roller, the mixture shall be compacted with hot hand tampers.

12.1 A.C. Curbs and Ditch Lining shall be finished to a smooth even texture and compacted to 90 percent of the density of a laboratory specimen of the same mixture subjected to 50 blows of a standard Marshall hammer on each side of the specimen. At the option of the Contractor, A.C. curbs may be shaped and compacted with an extrusion machine. The loose material shall be placed in one course.

13. JOINTS. The joints between old and new pavements or between lanes of new work shall be constructed so as to insure uniform bond, texture, density, and smoothness as in other sections of the course. Edges of existing pavement and previously placed strips shall be cut to straight, vertical surfaces. All contact surfaces of existing pavement shall be painted with a thin, uniform tack coat.

14. PROTECTION OF PAVEMENT. After final rolling, no vehicular traffic shall be permitted on the pavement for at least 6 hours after final rolling.

15. SURFACE REQUIREMENTS. The finished surface shall not vary more than 1/8 inch from a 10-foot straightedge placed parallel with the centerline and transverse from crown to edge. The straightedge shall be furnished by the Contractor. Defective areas shall be corrected by the Contractor at no additional cost to the Government.

16. SAMPLING. Sampling for the determination of thickness and density of the completed pavements will be performed by the Contracting Officer. All tests necessary to determine conformance with the specified requirements will be performed by the Contracting Officer without cost to the Contractor. The Contractor shall replace the pavement where samples are removed at his expense. No payment will be made for areas of pavement deficient in composition, density, or thickness until they are removed and replaced by the Contractor as directed by the Contracting Officer.

* * * * *

SECTION 9L

GUARDRAIL, WHEEL BUMPERS, AND TRAFFIC SIGNS

Index

1. Applicable Publications
2. Materials
3. Preservative Treatment
4. Metal Guardrail
5. Precast Concrete Wheel Bumper
6. Traffic Signs

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only form a part of this specification to the extent indicated by the references thereto.

1.1 Federal Specifications (Fed. Spec.).

QQ-S-634A & Am-1	Steel, Bar, Carbon, Cold Finished, (Standard Quality)
TT-P-105A & Am-1	Paint, Oil: Chalk-Resistant, Lead Free, Exterior, Ready-Mixed, White and Light Tints
TT-P-641F	Primer Coating; Zinc Dust-Zinc Oxide (For Galvanized Surfaces)
WW-P-406D	Pipe, Steel (Seamless and Welded) (For Ordinary Use)

1.2 Military Specifications (Mil. Spec).

MIL-C-15328C & Am-1	Primer (Wash), Pretreatment, Blue (Formula No. 117-B for Metals)
MIL-P-28582	Primer Coating, Exterior, Lead Pigment-Free (Undercoat for Wood, Ready-Mixed, White and Tints)

1.3 American Society for Testing and Materials (ASTM) publications.

A 123-73	Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
C 94-74a	Ready-Mixed Concrete

1.4 Redwood Inspection Service (RIS) publication.

Standard Specifications for Grades of California Redwood Lumber (November 1970, and Supplement No. 1, October 1, 1972)

1.5 West Coast Lumber Inspection Bureau (WCLB) publication.

No. 16	Standard Grading and Dressing Rules for West Coast Lumber (September 1, 1970).

1.6 American Association of State Highway and Transportation Officials (AASHTO) Standard.

M 180-70	Corrugated Sheet Steel Beams for Highway Guardrail

1.7 American Wood Preservers' Association (AWPA) Standard.

C 14-73	Wood for Highway Construction Preservative Treatment by Pressure Processes

2. MATERIALS.

2.1 Lumber.

2.1.1 Douglas Fir shall be No. 1 grade, graded in accordance with the standard grading and dressing rules of the West Coast Lumber Inspection Bureau.

2.1.2 Redwood shall be S4S construction heart, graded in accordance with rules for grading of the Redwood Inspection Service.

2.2 Drift Pins for wheel bumper shall be 3/4 inch pipe, 2 feet long and shall conform to Fed. Spec. WW-P-406, Weight A, Class 2 or galvanized, round bars of the same size conforming to Fed. Spec. QQ-S-634.

2.3 Metal Beam Guard Railing. Except as otherwise specified rail elements, terminal sections, bolts, nuts, and other fittings shall conform to AASHTO M 180. The rail metal shall be open hearth, oxygen furnace, or electric furnace steel and, in addition to conforming to the requirements of AASHTO M 180, shall withstand a cold bend, without cracking, of 180 degrees around a mandrel of a diameter equal to 2-1/2 times the thickness of the plate. The rail elements may be hot-dip galvanized before fabrication, in which case the provisions in Section 3 of ASTM A 123 shall not apply. The weight of zinc coating, on rail elements, per square foot of actual surface shall average not less than 2.0 ounces and no individual specimen shall show less than 1.8 ounces. Workmanship shall be equivalent to good commercial practice and all edges, bolt holes and surfaces shall be free of torn metal, burrs, sharp edges and protrusions. Bolts shall have shoulders of such shape that will prevent the bolts from turning. Holes in rail elements shall be of similar shape as the bolt shoulder. Rail elements shall be spliced at intervals not to exceed 12 feet 6 inches and such splices shall be made at posts, unless otherwise shown.

2.4 Paint.

2.4.1 Exterior Finish Paint for wood and metal shall conform to Fed. Spec. TT-P-105.

2.4.2 Metal Primer Paint shall conform to Fed. Spec. TT-P-641.

2.4.3 Vinyl-Type Wash Coat shall conform to Mil. Spec. MIL-C-15328.

2.4.4 Wood Primer Paint shall conform to Mil. Spec. MIL-P-28582.

2.5 Galvanizing shall conform to ASTM A 123.

2.6 Concrete Wheel Bumper shall be precast and constructed of reinforced concrete. Concrete shall conform to ASTM C 94, using 3/4 inch maximum size aggregate, and having a minimum compressive strength of 3,000 psi at 28 days. Bumpers shall be reinforced with two No. 3 reinforcing bars running the entire length of the section. The finish surface of the concrete shall be finished smooth and without blemish.

3. PRESERVATIVE TREATMENT. Lumber shall be preservative-treated after fabrication. Treatment shall be in accordance with AWPA C 14. Surfaces to be painted shall be treated with water-borne preservatives or pentachlorophenol in suitable solvents. After using a salt treatment, the moisture content of the lumber shall be reduced to not over 19 percent.

4. METAL GUARDRAIL.

4.1 Posts shall be treated Douglas fir 8 x 8 inches, 5 feet 4 inches long, and shall be rough or S4S. Only one type of post shall be used for any one continuous length of quardrail. Post shall be embedded 3 feet, in the ground and set in such position that the top of the guardrail shall be one inch below the top of the post. The space around the post shall be backfilled with approved earth material and shall be thoroughly tamped. The surface of the backfill shall be crowned. Posts placed in paved areas shall have the pavement replaced in kind around the posts and crowned. Spacing of posts shall be at equal intervals in accordance with the manufacturer's standards.

4.2 Blocks for metal beam guard railing shall be treated Douglas fir 8 inches x 8 inches nominal size by one foot 2-inches, rough or S4S. The size tolerance of rough sawn blocks in the direction of the bolt holes shall be not more than plus or minus 1/4 inch. Only one type of block shall be used for any one continuous length of guard railing. Blocks shall be toenailed to posts with one 16 penny galvanized nail on each side of the block.

4.3 Rail shall be installed so that the top of the rail shall be one inch below the top of the post. Ends of all rails shall be turned away from the roadway and shall be fitted with manufacturer's standard terminal sections. Joint design shall be in accordance with the manufacturer's standards. The rail at joints shall have full bearing. Rail element joints shall be lapped not less than 12-1/2 inches in the direction of traffic and bolted. The bolted connection of the rail element to the post shall withstand a 5,000-pound pull at right angles to the line of the railing.

4.4 Painting. Exposed portions of posts shall be painted with one prime coat and 2 finish coats of white paint. Guardrail shall be cleaned of all grease and other foreign material and shall be solvent cleaned and treated with vinyl-type wash coat. Vinyl-type wash coat shall be mixed by adding one volume of acid component to 4 volumes of resin component. The acid component shall be added slowly with constant stirring to the resin component. After mixing, the wash coat shall be used within 8 hours. If additional thinning is required to maintain a wet spray, reduction shall be made with normal butyl alcohol or 99 percent isopropyl alcohol. After the vinyl-type wash coat treatment the guardrail shall receive 2 prime coats and one finish coat of white paint.

5. PRECAST CONCRETE WHEEL BUMPER shall be installed where indicated. The bumper shall be secured by drift pins driven flush with the top of the bumper. Care shall be exercised not to damage the concrete in driving the pins. Any damaged sections of precast bumper shall be replaced by the Contractor at no additional cost to the Government.

6. TRAFFIC SIGNS.

6.1 Signs shall be of the type and size indicated and shall conform to the applicable requirement of the U.S. Department of Transportation, Federal Highway Administration "Manual on Uniform Traffic Control Devices for Streets and Highways," dated 1971. Signs shall be aluminum with either a baked enamel or porcelain enameled finish. Size and shape of lettering shall conform to the requirements of the Federal Highway Administration. Message shall be of reflective sheeting. Aluminum shall be alloy 6061-T6 or 5155-H36. Signs shall be the products of manufacturers regularly engaged in the manufacture of such products.

6.2 Posts. Except as otherwise specified, posts shall be redwood, 4 x 4 inches nominal size, with 1/2-inch chamfered tops, and embedded 2 feet 6 inches in the ground. Exposed portion of the post shall be painted with one prime and two finish coats of paint and the buried portion shall be dipped in hot asphalt. Posts supporting yellow warning signs shall be painted yellow. All other posts shall be painted white. An anchor piece of 1 x 4 x 8-inch material shall be nailed securely to the post approximately one foot from the lower end of the post. Posts for stop signs, parking signs, and other types of small signs may be galvanized metal at the option of the Contractor. Metal posts shall be unpainted galvanized steel, fabricated from one piece (without welds) of low carbon steel, conforming to Fed. Spec. QQ-S-634, of not less than No. 11 gage. Posts shall be hat-flanged in cross section, with overall dimensions of not less than 3 x 1-3/8 inches. Posts shall be galvanized after fabrication at least 2 inches wide by 6 inches high mounted on an 8 x 24-inch, or larger, target plate with baked enamel or other approved finish, bolted to the post, using a minimum of 2 bolts or, at the option of the Contractor, three 3-1/4-inch diameter plastic or glass reflectors may be used in lieu of the reflective tape.

6.3 Signs shall be bolted to posts using a minimum of 2 corrosion resistant bolts. Back braces is used shall be structural steel bars, sized as required.

* * * * *

SECTION 10A

SEEDING

Index

1. Applicable Publication
2. Materials
3. Sampling and Testing
4. Special Seeding
5. Preparation of Ground Surface
6. Application of Fertilizer
7. Planting Seed
8. Compacting
9. Watering
10. Protection
11. Establishment
12. Repair

1. APPLICABLE PUBLICATION. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extend indicated by the references thereto.

1.1 Association of Official Analytical Chemists (AOAC) Publication.

Offical Methods of Analysis (12th Edition, 1975; & Suppl. 1)

2. MATERIALS.

2.1 Fertilizer of 16-20-0 grade, uniform in composition, free flowing, and suitable for application with approved equipment, shall be provided. The fertilizer shall be delivered to the site in bags or other convenient containers, each fully labeled, conforming to the applicable state fertilizer laws, and bearing the name, trade name or trademark, and warranty of the producer.

2.2 Deleted.

2.3 Seed labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act shall be furnished. Seed shall be furnished in sealed, standard containers unless written exception is granted. Seed that is wet or moldy or that has been otherwise damaged in transit or storage will not be acceptable.

2.3.1 Seed.

2.3.1.1 Seed with the following minimum percentage by weight of pure live seed of each seed kind in the mixture in each lot shall be furnished:

a. Dam and Dike Embankments.

Species	% by weight of each seed kind in mixture	% by weight of pure live seed of each kind	% by weight of pure live seed in mixture
Atriplex glauca	20.8	75	15.6
Atriplex semibaccata	10.4	33	3.4
Cassia couvsii	10.4	70	7.3
Cercidium microphyllum	6.3	50	3.2
Dianthus bedfordi	8.4	80	6.7
Encelia farinosa	10.4	33	3.4
Eschscholtzia californica	10.4	54	5.6
Nicotiana glauca	2.1	60	1.3
Plantago insularis	20.8	75	15.6
Total pure live seed in mixture			62.1
Weed seed not to exceed 1% by weight			1.0
Other than weed and pure live seed, maximum			36.9
TOTAL			100

b. Borrow Pit Areas.

Species	% by weight of each seed kind in mixture	% by weight of pure live seed of each kind	% by weight of pure live seed in mixture
Aristida adscensionis	11.2	65	7.3
Atriplex canescens	22.2	50	11.1
Aplopappus linearifolius	4.4	20	.9
Chilopsis linearis	2.2	80	1.8
Isomeris arborea	11.2	49	5.5
Nicotiana glauca	2.2	60	1.3
Parkinsonia aculeata	13.3	50	6.7
Plantago insularis	33.3	75	24.9
Total pure live seed in mixture			59.5
Weed seed not to exceed 1% by weight			1.0
Other than weed and pure live seed, maximum			39.5
TOTAL			100

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

2.5 Water shall be free from oil, acid, alkali, salt, and other substances harmful to growth of grass, and shall be from a source approved prior to use.

2.6 Wood Cellulose Fiber Mulch, for use with the hydraulic application of seed and fertilizer, shall consist of specially prepared wood cellulose fiber, processed to contain no growth- or germination-inhibiting factors, and dyed an appropriate color to facilitate visual metering of application of the materials. The mulch material shall be supplied in packages having a gross weight not in excess of 100 pounds. The wood cellulose fiber shall contain not in excess of 10% moisture, air dry weight basis. The wood cellulose fiber shall be manufactured so that after addition and agitation in slurry tanks with fertilizers, seeds, water, and any other approved additives, the fibers in the material will become uniformly suspended to form a homogeneous slurry; and that when hydraulically sprayed on the ground, the material will form a blotter-like ground cover impregnated uniformly with seed; and which, after application, will allow the absorption of moisture and allow rainfall or mechanical watering to percolate to the underlying soil. Suppliers shall be prepared to certify that laboratory and field testing of their product has been accomplished, and that their product meets all the foregoing requirements based upon such testing.

3. SAMPLING AND TESTING shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Sampling and testing shall be performed by an approved commercial testing laboratory or may be performed by the Contractor subject to approval. Tests shall be performed in sufficient number to insure that materials meet the specified requirements. Copies of the test results shall be furnished to the Contracting Officer.

3.1 Fertilizer. Duplicate copies of invoices shall be furnished. Invoices shall show quantities and grade of fertilizer. Samples of each lot of fertilizer shall be tested in accordance with Offical Methods of Analysis of the Association of Official Analytical Chemists. Upon completion of project, a final check of total quantities of fertilizer used will be made against total area treated, and if minimum rates of application have not been met, additional quantities of these materials to make up minimum application specified shall be distributed as directed.

3.2 Seed. Contracting Officer shall be furnished duplicate signed copies of statement from vendor, certifying that each container of seed delivered is labeled in accordance with Federal Seed Act and is a least equal to requirements previously specified. This certification shall be obtained from vendor and shall be furnished on or with all copies of seed invoices.

3.3 Mulch. Within 5 days after award of contract, Contracting Officer shall be notified of sources from which mulch materials are available and the quantities thereof, and representative samples of the materials proposed for use shall be submitted for approval.

4. SPECIAL SEEDING.

4.1 Seeder. Equipment to be used for applying a seed-fertilizer mix over areas shall be a hydraulic seeder designed to pump and discharge a waterborne homogenous slurry of seed, fertilizer, and wood cellulose fiber at the desired specified rate. The seeder shall be equipped with a power-driven agitator, and shall be capable of discharging up to 200 gallons per minute at 100 pounds pressure from a nozzle with clearance for 1/2-inch solids.

4.2 Wood Cellulose Fiber Mulch Spreader. Hydraulic equipment used for the application of fertilizer, seed, and slurry of prepared wood pulp shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry containing up to 40 pounds of fiber plus a combined total of 70 pounds of fertilizer solids for each 100 gallons of water. The slurry distribution lines shall be large enough to prevent stoppage. The discharge shall be equipped with a set of hydraulic spray nozzles that will provide even distribution of the slurry. The slurry tank shall have a minimum capacity of 1,000 gallons and shall be mounted on a traveling unit which may be either self-propelled or drawn by a separate unit that will place the slurry tank and spray nozzles in a position to provide uniform distribution without waste. The Contracting Officer may authorize equipment with smaller tank capacity provided that the equipment has the necessary agitation system and sufficient pump capacity to spray the slurry in a uniform coat over the surface.

5. PREPARATION OF GROUND SURFACE.

5.1 General. Equipment, in good condition, shall be provided for the proper preparation of the ground and for handling and placing all materials. Equipment shall be approved before work is started.

5.2 Clearing. Prior to grading and tilling, vegetation that may interfere with operations shall be mowed, grubbed, and raked; the collected material shall be burned or removed from the site, or when suitable, the material shall be used for mulch as directed. The surface shall be cleared of stumps, stones larger than 3 inches in diameter, roots, cable, wire, and other materials that might hinder the work or subsequent maintenance.

5.3 Grading. Previously established grades shall be maintained on the areas to be treated in a true and even condition; necessary repairs shall be made to previously graded areas. Where grades have not been established, the areas shall be graded as shown, and all surfaces shall be left in an even and properly compacted condition to prevent formation of depressions. Finished grade shall be such that after subsequent treatments, i.e. tillage, and planting, the planted grade will join one inch below adjoining surfaced grade of walks and paving unless otherwise indicated.

5.4 Tillage. Areas to be seeded shall be tilled to a depth of at least 6 inches by plowing, disking, harrowing, or other approved operations until the condition of the soil is acceptable. The work shall be performed only during periods when, in the opinion of the Contracting Officer, beneficial results are likely to be obtained. When drought, excessive moisture, or other unsatisfactory conditions prevail, the work shall be stopped when directed. Undulations or irregularities in the surface shall be leveled before the next specified operation.

6. APPLICATION OF FERTILIZER.

6.1 Preplanting Application. Fertilizer shall be distributed uniformly at a rate of 300 pounds per acre over areas to be seeded. The fertilizer shall be incorporated into the soil to a depth of at least 4 inches by disking, harrowing or other acceptable methods. Incorporation of fertilizer may be part of the tillage operations specified hereinbefore.

6.2 Leveling. Surface irregularities resulting from tillage or other operations before seeding shall be leveled.

7. PLANTING SEED.

7.1 General. Seed shall be sown between dates of 15 September and 15 March unless otherwise directed in writing. Except as otherwise specified, a satisfactory method of sowing shall be employed, using approved mechanical power-drawn drills or seeders, mechanical hand-seeders, cultipacker hydraulic seeders, or other approved methods. When drills are used, markers or other means shall be provided to insure that the successive seeded strips will overlap or be separated by a space no greater than equipment row spacings. When delays in operations extend the work beyond the most favorable planting season for species designated or when conditions are such by reason of drought, high winds excessive moisture, or other factors that satisfactory results are not likely to be obtained, work shall be halted as directed and resumed only when conditions are favorable or when approved alternate or corrective measures and procedures have been effected. If inspection during seeding operations or after there is show of green indicates that strips wider than space between rows planted have been left unplanted, or other areas skipped, additional seed shall be sown if so directed.

7.2 Native-Grass Seeding shall be accomplished with a cultipacker seeder. Seed shall be sown uniformly over designated areas. Sowing rates shall be adjusted to provide pure live seed of designated species in the following amounts:

Seed Kind	Pounds of Pure Live Seed Per (acre) (1,000 square feet)
Main Embankment, Dike No. 1 and Dike No. 2	
Atriplex glauca	10 lbs.
Atriplex semibaccata	5 lbs.
Cassia couvsii	5 lbs.
Cercidium microphyllum	3 lbs.
Dianthus bedfordi	4 lbs.
Encelia farinosa	5 lbs.
Eschscholtzia californica	5 lbs.
Nicotiana glauca	1 lb.
Plantago insulavis	10 lbs.
Borrow Pit Areas and All Other Areas Requiring Seeding Except for the Embankments as Described Above	
Aplopappus linearifolius	2 lbs.
Aristida adscensionis	5 lbs.
Atriplex canescens	10 lbs.
Chilopsis linearis	1 lb.
Isomeris arborea	5 lbs.
Nicotiana glauca	1 lb.
Parkinsonia aculeata	6 lbs.
Plantago insularis	15 lbs.

Seed shall not be broadcast during windy or adverse weather.

7.3 Hydraulic Seeding. Seeding with approved hydraulic seeding equipment shall be accomplished in a manner to provide the same application rates for seed and fertilizer specified hereinbefore. Covering of seed and subsequent compacting will not be required when hydraulic seeding methods are used. Areas not to be seeded and structures shall be protected.

8. COMPACTING. Except where hydraulic seeding is used immediately after seeding operations have been completed, the surface shall be compacted by a cultipacker, roller, or other approved equipment weighing 100 to 160 pounds per linear foot of roller. When planting by machine, the roller shall be operated immediately behind the planter unless otherwise directed. Under certain soil conditions, the Contracting Officer may direct that rolling be delayed for 15 to 30 minutes following planting to avoid balling the soil on the roller or squeezing water out of furrows. If the soil is of such type that a smooth or corrugated roller cannot be operated satisfactorily, a pneumatic-tired roller, not wobble-wheel, shall be used. A roller having tires of sufficient size shall be used, or sufficient passes of the roller shall be made, to cover the soil surface completely.

9. WATERING. Watering equipment of a type that prevents damage to finished surface shall be used.

10. PROTECTION shall be provided against traffic or other use by erecting barricades immediately after treatment is completed, and by placing warning signs, as directed, on various areas.

11. ESTABLISHMENT. The Contractor shall be responsible for the proper care of the seeded areas during the maintenance priod while grass is becoming established. This period shall extend for 90 days after the completion of the seeding on the entire project. Immediately after seeding and during the maintenance period the Contractor shall water the seeded areas as required to obtain germination and maintain complete growth.

12. REPAIR. When any portion of the surface becomes gullied or otherwise damaged or treatment is destroyed, the affected portion shall be repaired to reestablish condition and grade of soil and treatment prior to injury, as directed. Repair work required because of faulty operations or negligence on the part of the Contractor shall be performed without cost to the Government.

* * * * *

SECTION 10B

TREES, SHRUBS, AND CACTI

Index

1. Applicable Publications
2. Source Inspections
3. Submittals
4. Delivery, Storage, and Handling
5. Deleted
6. Environmental Protection
7. Materials
8. Installation
9. Plant Establishment Period
10. Landscaping Stone

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 Federal Specification (Fed. Spec.).
O-F-241D — Fertilizers, Mixed, Commercial

1.2 American National Standards Institute (ANSI) Publication.
Z60.1-1973 — Nursery Stock

1.3 American Joint Committee on Horticultural Nomenclature (AJCHN) Publication.
Second Edition-1942 — Standarized Plant Names

2. SOURCE INSPECTIONS.

2.1 Plant Materials. Plant materials will be inspected by the Contracting Officer at the growing site and tagged or otherwise approved for delivery. Such inspection does not preclude right of rejection at the project site.

3. SUBMITTALS.

3.1 Samples. The following samples shall be submitted for approval before work is started.

a. Organic Mulch--10 pounds of each type to be used in the project.

3.2 Certificates of Conformance or Compliance. Before delivery, notarized certificates attesting that the following materials meet the requirements specified, shall be submitted in triplicate for approval.

a. Plant Materials

b. Fertilizers

4. DELIVERY, STORAGE, AND HANDLING.

4.1 Delivery.

4.1.1 The Contractor shall notify the Contracting Officer of the delivery schedule in advance so the plant material may be inspected upon arrival at the job site. Unacceptable plant material shall be removed from the job site immediately.

4.1.2 Plants shall be protected during delivery to prevent damage to the root balls or desiccation of leaves. Trees shall be protected during transportation by tying in the branches and covering all exposed branches.

4.1.3 The use of equipment such as "tree spades" shall be permitted provided that the plant balls are sized in accordance with ANSI Z60.1 and tops are protected from damage.

4.1.4 Fertilizer shall be delivered to the site in the original, unopened containers bearing the manufacturer's guaranteed chemical analysis, name, trade name or trademark, and in conformance to state and Federal law. In lieu of containers, fertilizer may be furnished in bulk and a certificate indicating the above information shall accompany each delivery.

4.1.5 Pesticide material, including soil fumigants, shall be delivered to the site in the original unopened containers. Containers that do not have a legible label that identifies the Environmental Protection Agency registration number and the manufacturer's registered uses will be rejected.

4.2 Storage.

4.2.1 Plants not installed on the day of arrival at the site shall be stored and protected as follows.

a. Outside storage shall be shaded and protected from the wind.

b. Bare root plants shall be heeled-in.

c. Plants stored on the project shall be protected from drying out at all times by covering the balls or roots with moist sawdust, wood chips, shredded bark, peat moss, or other similar mulching material. Cactus roots shall be left dry.

d. Plants, including those in containers, shall be kept in a moist condition until planted by watering with a fine mist spray.

4.2.2 Fertilizer shall be kept in dry storage away from contaminants.

4.2.3 Storage of materials shall be in areas designated or as approved by the Contracting Officer.

4.3 Handling. Care shall be taken to avoid damaging plants being moved from the nursery or storage area to the planting site. Plants shall be protected from drying out. Balled and burlapped plants shall be handled carefully to avoid cracking or breaking the earth ball. Plants shall not be handled by the trunk or stems. Bare-root plants shall be "puddled" when removed from the heeling-in bed to protect the roots from drying out. Plants shall be protected from freezing or drying out by a covering of burlap, tarpaulin, or mulching material during transportation from the heeling-in bed to the planting site. Damaged plants will be rejected and shall be removed from the site.

5. DELETED.

6. ENVIRONMENTAL PROTECTION. All work and Contractor operations shall comply with the requirements of section: ENVIRONMENTAL PROTECTIOK.

7. MATERIALS.

7.1 Plants.

7.1.1 Plants shall conform to the varieties specified in the plant list and be true to botanical names as listed in AJCHN Standarized Plant Names. Plants shall be in accordance with ANSI Z60.1 except as otherwise stated in the specifications or shown on the plans. Where the drawings or specifications are in conflict with ANSI Z60.1, the drawings and specifications shall prevail.

7.1.2 Planting stock shall be well-branched and well-formed, sound, vigorous, healthy, and free from disease, sun-scaled, windburn, abrasion, and harmful insects or insect eggs and shall have healthy, normal and unbroken root systems. Deciduous trees shall be symmetrically developed, of uniform habit of growth, with straight boles or stems and free from objectionable disfigurements. Evergreen shrubs shall have well developed symmetrical tops with typical spread of branches for each particular species or variety. Plants shall have been grown under climatic conditions similar to those in the locality of the project. Plants budding into leaf or having soft growth shall be sprayed with an anti-desiccant at the nursery and collecting field before digging.

7.1.3 The minimum acceptable sizes of all plants, measured before pruning and with branches in normal position, shall conform to the measurements indicated. Plants larger in size than specified may be used with the approval of the Contracting Officer, with no change in the contract price. If larger plants are used, the ball of earth or spread of roots shall be increased in accordance with ANSI Z60.1.

7.1.4 The Contractor shall facilitate inspection and identification by labeling trees and bundles or containers of the same shrub, ground cover, or vine with a durable waterproof label and weather-resistant ink. Labels shall state the correct plant name and size as specified in the list of required plants. Labels shall be securely attached to plants, bundles, and containers of plants and shall be legible for 60 days after delivery to the planting site.

7.1.5 Plant material shall be nursery grown unless otherwise indicated and shall conform to the requirements and recommendations of ANSI Z60.1. Plants shall be dug and prepared for shipment in a manner that will not cause damage to branches, shape, and future development after planting.

7.1.5.1 Balled and Burlapped (B & B) plants shall have ball sizes and ratios conforming to ANSI Z60.1. Plants shall be balled with firm, natural balls of soil. B & B plants shall be wrapped firmly with burlap, strong cloth, or plastic and tied.

7.1.5.2 Container grown plants shall have sufficient root growth to hold the earth intact when removed from containers but shall not be root bound.

7.1.6 Substitutions shall be made only when a plant is not obtainable and the Contracting Officer authorizes a change order providing for use of the nearest equivalent obtainable size or variety of plant having the same essential characteristics with an equitable adjustment of the contract price. If all other requirements are met, any plant may be furnished.

a. Container-grown instead of balled or burlapped.

7.1.7 Salvaged Cacti from area of construction operations, shall be removed from its original location by cutting the shallow roots by means of forcing a sharp shovel, blade depth, into the soil completely around the plant about a foot away from the base. The plant shall be carefully pried and lifted out of the ground. Loose soil may be allowed to fall away from the roots.

7.1.7.1 Damaged roots shall be removed. Remaining lateral roots stubs shall be pruned, leaving them 5 to 10 inches long. All cut ends and other wounds shall be dusted with powdered sulphur.

7.1.7.2 Salvaged Cacti shall be stored in a shaded, open area for one to two weeks before transplanting. Cacti shall be transplanted before the plant rots or drys out.

7.2 Soil Conditioners.

7.2.1 Rotted sawdust shall have 7.5 pounds of nitrogen added uniformly to each cubic yard and shall be free of chips, stones, sticks, soil and toxic substances.

7.3 Planting Soil Mixture. The planting soil mixture shall be composed of 200 parts topsoil, 100 parts rotted sawdust, 1 part gypsum, and 1 part fertilizer.

7.4 Fertilizer. Fertilizer shall be commercial grade and uniform in composition and shall conform to applicable state and Federal regulations.

7.4.1 Granular fertilizer shall conform to Fed. Spec. O-F-241, Type I, Level B, and shall bear the manufacturer's guaranteed statement of analysis. Granular fertilizer shall contain a minimum percentage by weight of: 20 nitrogen (of which 50 percent shall be organic), 10 available phosphoric acid, and 10 potash.

7.4.2 With the approval of the Contracting Officer, packet, tablet, pellet, or other forms of slow release fertilizers may be used.

7.5 Mulch. Mulch shall be free from deleterious materials and shall be stored so as to prevent inclusion of foreign materials.

7.6 Staking Material.

7.6.1 Stakes for tree and cactus support shall be rough sawn wood, free from knots, rot, cross grain, or other defects that would impair the strength. Standard stakes shall be a minimum of 2 inches by 2 inches by 8 feet long and pointed at one end.

7.6.2 Wire shall be 12-gage annealed galvanized steel.

7.6.3 Hose for tree ties shall be new, 1/2 inch diameter reinforced rubber or plastic hose and shall be all the same color on the project.

7.6.4 Cloth for cactus ties shall be new, 4 inch wide, doubled-up, cotton linen and white in color.

7.7 Water. Water shall not contain elements toxic to plant life. The source of water and service outlets used shall be subject to approval of the Contracting Officer and shall be obtained at a cost to the Contractor.

7.8 Tree Wound Dressing. Tree wound dressing shall be a white shellac.

8. INSTALLATION.

8.1 Planting Seasons and Conditions. Planting shall be done between 1 May and 30 September.

Planting shall be done with the approval of the Contracting Officer only when the ground is not frozen, snow covered, or in an otherwise unsuitable condition for planting. If special conditions exist that may warrant a variance in the above planting dates or conditions, a written request shall be submitted to the Contracting Officer stating the special conditions and proposed variance.

8.2 Layout. Plant material locations and bed outlines shall be staked on the project site by the Contractor and approved by the Contracting Officer before any plant pits or beds are dug. The Contracting Officer may adjust plant material locations to meet field conditions.

8.3 Excavation for Planting.

8.3.1 Prior to excavating for plant pits and beds the area shall conform to the lines and grades shown on the plans and the location of any underground utilities shall be verified by the Contractor and the Contracting Officer. Damage to utility lines shall be repaired at the Contractor's expense.

8.3.2 Rocks and other underground obstructions shall be removed to a depth necessary to permit proper planting according to plans and specifications. If underground utilities, construction, or solid rock ledges are encountered, other locations may be selected by the Contracting Officer.

8.3.3 Plant pits may be dug by any method approved by the Contracting Officer provided that the pits have vertical sides and flat bottoms. When pits are dug with an auger and the sides of the pits become glazed, the glazed surface shall be scarified. The size of plant pits shall be as shown on the plans.

8.3.4 Where existing soil is to be used in place, plant beds shall be tilled to a depth of 6 inches. Decomposed granite shall be spread uniformly over the bed to a depth of 4 inches and thoroughly incorporated into the existing soil to a depth of 4 inches using a rototiller or similar type of equipment to obtain a uniform and well pulverized soil mix. During tillage operations all sticks, stones, roots, and other objectionable materials shall be removed. Plant beds shall be brought to a smooth and even surface conforming to established grades.

8.3.5 Excess soil shall be used to form watering basins around plants, as specified herein or removed from the project site.

8.4 Setting Plants. Balled and burlapped and container-grown plants shall be handled and moved only by the ball or container. Plants shall be set plumb and held in position until sufficient soil has been firmly placed around roots or ball. Plants shall be set in relation to surrounding grade as indicated. Care shall be taken to avoid contaminating the mulch with the planting soil.

8.4.1 Balled and burlapped stock shall be backfilled with planting soil mixture to approximately half the depth of the ball and then tamped and watered. Excess burlap and tying materials shall be carefully removed or folded back. If plastic wrap is used in lieu of burlap, it shall be completely removed before the placement of backfill. The remainder of backfill of planting soil mixture shall be tamped and watered. Earth saucers or water basins shall then be formed around isolated plants as indicated.

8.4.2 Container grown stock shall be removed from containers in such a way so as to prevent damage to plant or root system. Planting shall be completed as specified herein under balled and burlapped plants.

8.5 Before transplanting cacti, mark the north side with chalk, ribbon, etc., in order that the cacti will be replanted with that side facing north.

8.5.1 Cacti shall be replanted in dry soil until new growth appears at the apex (tips) of the plant. Soil shall be mounded around the base of the transplants as indicated.

8.6 Mulching.

8.6.1 Mulching shall take place within 48 hours after planting.

8.7 Staking.

8.7.1 Plants shall be staked as indicated.

8.8 Pruning.

8.8.1 New plant material shall be pruned in the following manner: Dead and broken branches shall be removed. Deciduous trees shall be pruned to reduce total amount of anticipated foliage by one fourth to one third. Typical growth habit of individual plants shall be retained with as much height and spread as is practicable. Cuts shall be made with sharp instruments, and shall be flush with trunk or adjacent branch to insure elimination of stubs. "Headback" cuts at right angles to line of growth shall not be permitted. Trees shall not be poled or the leader removed. Trimmings shall be removed from the site. Cuts 1/2 inch in diameter and larger shall be painted with the specified tree wound dressing.

8.9 Restoration and Clean-Up. Excess and waste material shall be removed daily. When planting in an area has been completed, the area shall be cleared of all debris, spoil piles, and containers. The Contractor shall restore disturbed areas to their original condition at his expense. Paving shall be cleaned when work in adjacent areas is completed.

8.10 Maintenance During Installation. Maintenance operations shall begin immediately after each plant is planted and shall continue as required until final acceptance. Plants shall be kept in a healthy, growing condition by watering, pruning, spraying, weeding, and any other necessary operations of maintenance. Plant saucers and beds shall be kept free of weeds, grass, and other undesired vegetation. Plants shall be inspected at least once per week by the Contractor during the installation period and needed maintenance performed promptly.

9. PLANT ESTABLISHMENT PERIOD. Final acceptance of all work and materials under this section shall be at the end of a period of establishment to be determined as follows.

9.1 Beginning of the Plant Establishment Period. The period of establishment shall begin on the date that an inspection by the Contracting Officer shows that all plants are in place and have been installed in accordance with the specifications and plans. Replacement of plants that were not supplied by the Contractor but were relocated under this contract and that die for any reason other than improper handling during transplanting and/or lack of proper care will not be required. Loss through Contractor negligence, however, shall require replacement in kind and size per specification and shall be at the Contractor's expense.

9.2 During the Plant Establishment Period.

9.2.1 During the plant establishment period, unless otherwise specified, the Contractor shall water all plants as necessary to maintain an adequate supply of moisture within the root zone. An adequate supply of moisture is estimated to be the equivalent of one inch of absorbed water per week that is delivered at weekly intervals in the form of natural rain or is augmented as required by periodic waterings. Water shall not be applied with a force sufficient to displace mulch and shall not be applied so quickly that it cannot be absorbed by the mulch and plants.

9.2.2 Plants shall be pruned and mulch replaced as required.

9.2.3 Stakes and eroded plant saucers shall be replaced as required.

9.2.4 In plant beds, weeds shall not be allowed to reach a height of 3 inches before being completely removed, including the root growth.

9.2.5 Other work, such as spraying with approved insecticides and fungicides to control pests, shall be done to ensure plant survival in a healthy growing condition.

9.2.6 Dead plants shall be removed immediately at the Contractor's expense. The Contractor will not be responsible for theft or damage to plants by vehicles or vandalism following completion and approval of the installation portion of the planting contract.

9.3 Termination of the Plant Establishment Period.

9.3.1 A preliminary inspection by the Contractor and the Contracting Officer will be held 3 months from the date of the beginning of the plant establishment period to determine plant acceptability and the number of replacements. Alternate or substituted varieties of plants shall be used only if approved by the Contracting Officer.

9.3.2 A final inspection of all plants will be held after the replacement planting has been completed. No additional plant establishment period will be required for replacement plants. The establishment period will end on the date of this inspection and said inspection will be considered final acceptance provided the Contractor has complied with the following requirements.

a. Dead, missing, and defective plant material shall have been replaced as directed by the Contracting Officer; otherwise, final acceptance will be delayed until such replacements have been satisfactorily accomplished.

b. Plant beds and plant saucers shall have been properly mulched and shall be free of weeds.

c. Stakes shall be in good condition.

d. Remedial measures directed by the Contracting Officer to ensure plant survival shall have been carried out.

10. LANDSCAPING STONE. All stone shall be sound durable, hard, and of such character that it will not disintegrate from the action of air, water, or the conditions to be met in landing or placing. All stone shall be clean and free from earth, clay, refuse and adherent coating. Stone size shall be within the limits indicated. Samples of stone shall be submitted for approval in accordance with the SPECIAL PROVISIONS. Stone shall be placed in a 'natural' reclining position with exposure as indicated. The Contracting Officer shall be notified at least 72 hours prior to placement.

* * * * *

SECTION 11A

GAGES AND MONUMENTS

Index

1. Applicable Publications
2. General
3. Materials
4. Installation

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 American Society for Testing and Materials (ASTM) Standards.

A 36-75	Structural Steel
A 120-73	Black and Hot Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Use

1.2 The American Association of State Highway and Transportation Officials (AASHTO) Standards.

M 36-74	Zinc Coated (Galvanized) Corrugated Iron or Steel Culverts and Underdrains

1.3 American National Standards Institute (ANSI) Standards.

B 16.3-1971	Malleable-Iron Threaded Fittings, 150 and 300 lb.

1.4 Porcelain Enamel Institute (PEI) Inc.

PEI:S-100(65)	Specification for Architectural Porcelain Enamel on Steel for Exterior Use

2. GENERAL.

2.1 Submittals. The Contractor shall submit shop drawings for the staff gages in accordance with the SPECIAL PROVISIONS. Shop drawings shall include complete material description, fabrication and installation details.

2.2 Unless otherwise specified herein, workmanship, galvanizing, welding and materials shall conform to the applicable requirements of the section: MISCELLANEOUS METALS AND MATERIALS.

2.3 Painting shall conform to the applicable requirements of the section: PAINTING GENERAL.

2.4 Concrete shall conform to the applicable requirements of the section: CONCRETE CONSTRUCTION.

3. MATERIALS.

3.1 Tamper Proof Machine Screws and Wood Screws shall be round head, corrosion resistant, steel size as indicated.

3.2 Reference and Settlement Monuments Plates shall be Government-furnished bronze disks. The Contractor shall stamp the type of monument and monument number on the disks prior to installation.

3.3 Staff Gage and Number Plates shall be fabricated with low carbon steel or iron. Gage face of graduated section and numeral plates shall be finished with porcelain enamel conforming to PEI:S-100. Noncorrosive soft metal eyelets shall be installed permanently in each screw hole.

3.4 Steel Plates and Shapes shall be structural steel conforming to ASTM A 36, galvanized.

3.5 Conduit Between Gage Well, Recorder House and Stilling Basin shall be steel pipe conforming to ASTM A 120, standard weight, galvanized. Steel Pipe Fittings shall be malleable iron, threaded, 150 lb. class, conforming to ANSI B 16.3

3.6 Corrugated Metal Pipe for Gage Well shall conform to AASHTO M 36.

3.7 Rockfill for Gage Well shall be crushed stone or gravel, or natural gravel. Fill material shall be clean, sound, durable and free of clay lumps or friable particles. Material shall be uniformly graded between 3/8 inch and 1-1/2 inches.

3.8 Cast Iron Pull Boxes shall be waterproof with bolt down cover and gasket, weight 24 lbs. minimum, inside dimensions as indicated. Outlets shall be drilled and tapped to accommodate the conduit. Pull boxes shall be galvanized inside and outside. Bolts for cover shall be stainless steel. Gaskets shall be the box manufacturers standard.

4. INSTALLATION.

4.1 General. Gages and monuments shall be installed at the locations indicated. Exact locations of monuments will be determined by the Contracting Officer. Gages and monuments shall not be installed until all pavement, slope protection and related work has been completed. Surveys to determine elevations for monuments will be accomplished by the Government.

4.2 Excavation for concrete footings shall b e of the dimensions indicated. If bedrock is encountered before reaching the required depth, the excavation shall be continued to the depth indicated or 18 inches into the bedrock, whichever is less. Prior to placing concrete, the excavation shall be cleared of loose material. Waste material shall be disposed of as directed.

4.3 Staff Gage.

4.3.1 Post Setting. Posts shall be set plumb in concrete bases of dimensions indicated. Concrete shall be thoroughly compacted so as to be free of voids and finished in a dome.

4.3.2 Staff Gage Face Section and Numerals shall be accurately mounted to the exact elevation corresponding to the numeral and the gradations. Screws shall be tightened without damage or cracking of the porcelain enamel finish.

4.4 Monument Disks shall be set in concrete bases as indicated. Concrete shall be thoroughly compacted so as to be free of voids and top surface finished level. Disks shall be installed in the fresh concrete so that the bottom of the disk is flush with the top surface of the concrete footing. After the concrete has set, all laitance or other adhering material shall be removed from the disk.

* * * * *

SECTION 14A

BUILT-UP ROOFING

Index

1. Applicable Publications
2. General
3. Materials
4. Roofing Systems
5. Application of Roofing
6. Flashings
7. Roof Cutout Samples
8. Surfacing

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 Federal Specifications (Fed. Spec.).

HH-R-590A	Roofing, Felt (Asbestos, Asphalt Saturated)
SS-C-153B	Cement, Bituminous, Plastic
SS-R-620B	Roofing Felt, Glass Fiber, Asphalt Coated (for Flashing and Roofing)

1.2 American Society for Testing and Materials (ASTM) publications.

D 226-75	Asphalt-Saturated Roofing Felt for Use in Waterproofing and in Constructing Built-Up Roofs
D 312-71	Asphalt for Use in Constructing Built-Up Roof Coverings
D 1863-64	Mineral Aggregate for Use on Built-Up Roofs
D 2626-73	Asphalt-Base Sheet for Use in Construction of Built-Up Roofs

2. GENERAL. Asphalt built-up roofing shall be applied to the roof surfaces indicated. Bituminous-plastic-type flashings installed in accordance with these specifications shall be used throughout unless otherwise specified or indicated. Asphalt shall be used with asphalt-saturated felts. The entire roof-deck construction of the building shall be completed before roofing work is begun thereon. The roofing or flashing shall be applied to a smooth and firm surface free from ice, frost, moisture, dirt, projections, and foreign materials. Application of roofing shall not be performed under excessive wind conditions, wet conditions, or when the ambient temperature is less than 40 degrees F. Vents and other items penetrating the roof shall be secured in position and properly prepared for flashing. Surfaces shall be inspected and approved immediately prior to application of roofing and flashings. Roofing materials shall be stored in an approved manner and shall be protected from contact with soil and exposure to the elements. Felt rolls and roll roofing shall be stored stacked on end. Immediately before laying, felt rolls and roll roofing shall be stored for 24 hours in an area maintained at a temperature no lower than 50 degrees F.

3. MATERIALS shall conform to the following requirements.

3.1 Deleted.

3.2 Bitumen.

3.2.1 Asphalt. ASTM D 312, Type III.

3.2.2 Sheathing Paper. Rosin-sized, weighing not less than 5 pounds per square or unsaturated felt weighing approximately 7-1/2 pounds per square.

3.3 Felt. Felt shall be the bituminous saturated type and shall conform to the following requirements.

3.3.1 Organic-fiber Felt.

3.3.1.1 Asphalt-saturated Roofing Felt. ASTM D 226, Type I.

3.3.2 Glass-fiber Felt.

3.3.2.1 Asphalt-saturated Roofing Felt. Fed. Spec. SS-R-620, Type I except that minimum weight shall be 7.5 pounds per square.

3.3.3 Asbestos Fiber Felt.

3.3.3.1 Asphalt-saturated Roofing Felt. Fed. Spec. HH-R-590, Type I, Class A, minimum weight of 13 pounds per square.

3.4 Nails, Fasteners, and Anchors. Nails, fasteners, and anchors shall be an approved type recommended by the roofing felt manufacturer.

3.5 Bituminous Cement. Fed. Spec., SS-C-153, Type I with asphalt-saturated felts.

3.6 Surfacing Materials. Crushed stone, gravel, or crushed slag shall conform to ASTM D 1863. Subject to approval, other materials may be used when blended to the grading requirements of ASTM D 1863.

3.7 Gravel Stop and Fasciae. Extruded aluminum, 0.075 inch minimum thickness or smooth sheets as follows:

Copper	20 ounces per square foot
Aluminum	0.050 inch minimum thickness
Stainless Steel	0.018 inch minimum thickness

4. ROOFING SYSTEMS.

4.1 Asphalt Built-up 4-ply Organic Roofing. Over wood surface, one thickness of sheathing paper shall be laid with joints lapped at least 2 inches and nailed sufficiently to hold the paper or felt in place until roofing felt is applied. Three plies of 15-pound asphalt-saturated felt shall be immediately laid shingle-fashion in hot solid moppings of asphalt. Each ply shall be lapped as specified in Table I and fastened in accordance with Table II. The flashings shall be installed and the flood coat and surfacing applied.

5. APPLICATION OF ROOFING. The entire roofing system, including aggregate surfacing, shall be finished in one operation up to the line of termination at end of day's work. Phased construction will not be permitted. Asphalt shall not be heated above 475 degrees F. Kettlemen shall be in attendance at all times during the heating to insure that the maximum temperature specified is not exceeded. Temperature of bitumen at the time it is applied shall be in accordance with the roofing felt manufacturers recommendations. Application temperatures shall be measured at the mop bucket - and/or mechanical applicator. Layers of roofing shall be laid free of wrinkles or buckles at right angles to the slope of the deck, immediately behind the mop. Each layer of organic roofing felt shall be laid in not less than 15 pounds of asphalt of per square, and a maximum of 25 pounds of asphalt per square. Each layer of glass-fiber felt shall be laid in not less than 20 pounds of asphalt per square or more than 30 pounds of asphalt per square. Each layer of asbestos felt shall be laid in not less than 15 pounds of asphalt per square or more than 25 pounds of asphalt per square. To insure a waterproof membrane, care shall be taken to preclude bare spots between plies. To prevent slippage, care shall be taken to preclude use of an excessive amount of bitumen. Bitumen shall uniformly cover all roof areas to be mopped to provide effective bond. Each course of roofing felts, in addition to being mopped in hot bitumen, shall be lapped as specified in Table I. For roof slopes above 1/2 inch per foot, felts shall be nailed as specified in Table II or III. The surface of the felts shall be carefully broomed-in with an 18- or 20-inch-wide, soft-fiber-type floor broom to obtain complete adhesion between plies and to eliminate air pockets. The method of mopping a half-sheet width and turning the sheet back to mop under the other half shall not be used. Workmen shall not walk on mopped surfaces when the bitumen is sticky.

Bitumen stops, formed of edge envelopes shall be installed at eaves and rakes. Envelopes shall be formed of two 18-inch wide layers of roofing felt. Only organic or asbestos felts shall be used; glass fiber felts shall not be used for this portion of the work. Nine inches of the width shall be attached to the roof surface with 9 inches extending beyond the edge. The first layer shall be applied in a 4-inch wide layer of plastic roofing cement and nailed 1/2-inch from the roof edge at 6-inch spacing. The second layer shall be applied to the first in a 9-inch wide mopping of bitumen. The free edges shall be protected from damage throughout the roofing period. After the last ply of roofing felt is applied, the edge felts shall be individually folded back and mopped to the roof surface. The gravel stop shall be embedded in bituminous cement and nailed on top of the envelope formed by the felt turnback.

5.1 Nails and Fasteners. Nails and fasteners for securing roofing shall be flush-driven through flat metal disks of not less than 1-inch diameter. Metal disks may be omitted where heads of fasteners are equivalent in size to the 1-inch diameter disks.

5.2 Mechanical Application. Mechanical application devices shall be mounted on pneumatic tired wheels, and shall be designed and maintained to operate without damaging the roofing membrane.

6. FLASHINGS.

6.1 Gravel Stops and Fasciae shall be provided for roof edges. Sheets shall be fabricated without longitudinal joints except where two-piece fasciae are used when fascia depth exceeds 7 inches. Provision for expansion shall be provided at joints. Factory fabricated internal and external corner units with mitered joints shall be provided. Roof flange and splice plate of the gravel stop and fascia shall extend out on the roof not less than 4 inches, and shall be set in plastic bituminous cement over the roofing felt. Roof flange shall be nailed with nails spaced not greater than 3 inches on centers located within 1 inch of the outer edge of the flange. The fascia section shall not be face nailed except as specified for two-piece fasciae. The upper piece of two-piece fascia is the same as specified above except that the fasica depth shall be at least 3-1/2 inches, and it shall overlap the lower fascia not less than 2 inches. The lower piece shall be hooked 1/2 inch over edge strip and splice plate and face nailed on 12-inch centers 1 inch below top of sheet. The upper fascia shall be hemmed 1/2 inch at lower edge and shall be formed to fit tight against lower fascia. Either smooth or corruguated sheets specified hereinafter, may be used at the option of the Contractor When aluminum is indicated in Table I, the gravel stop and fascia may be of extruded aluminum.

6.1.1 Extrusions. The extruded type of aluminum gravel stop and fascia shall be a factory fabricated, prepackaged, complete system with fastenings, of the style indicated. The system shall be installed in accordance with the manufacturer's recommendations and the other requirements herein specified. Extruded cover plate shall be provided over each joint. Aluminum sheet flashing 0.025 inch thick by at least 12 inches wide and having a depth to within 1 inch of the bottom edge of fascia shall be applied under the gravel stop and fascia at each joint.

6.1.2 Sheets, smooth. Joining shall be as specified in table II. Gravel stops shall be installed with 1/2-inch space between sections. The joint shall be covered with a 6-inch wide cover plate formed to the profile of the gravel stop. The cover plate shall be embedded in mastic, nailed through the opening between the gravel stop sections and loose locked to the drip edge. The lower hooked edge shall be bent outward at an angle of 30 degrees. When fascia exceeds 6 inches in depth, one or more horizontal steps not less than 1/2 inch high shall be formed in the fascia. When fascia exceeds 7-inch depth, two-piece fascia shall be used.

6.2 Strip Flashings. Roof flanges of sheet-metal flashings such as gravel stops, shall be stripped with two layers of roofing felt set in plastic cement. After installation of flanges or flashings over the top ply of roofing, the strip flashings, consisting of two layers of roofing felt, 9 and 12 inches wide, shall be successively cemented to the top of the roof flange using bituminous plastic cement, to form a waterproof joint between roofing and flashings.

7. ROOF CUTOUT SAMPLES. Samples shall be taken as directed by the Contracting Officer when there is reason to believe that deficiencies exist in the roofing membrane. When samples indicate deficiencies in the roofing membrane, corrective action shall be taken as directed.

8. SURFACING. After roofing felts have been laid and flashings installed, the entire roof surface, shall be flood-coated uniformly with 60 pounds of hot asphalt per square. While bitumen is still hot, 400 pounds per square of roofing gravel or 300 pounds per square of other approved aggregate shall be embedded therein. Aggregate shall be placed in the manner and quantity required to form a compact embedded overlay. Roof surface shall be swept and all loose aggregate removed. Flood coat and aggregate shall be applied the same day as the felts are laid. If there is a probability of rain falling on the felts before the flood coat and aggregate can be applied, a light glaze coat of bitumen, 10 to 15 pounds per square, shall be applied over the exposed felts. The glaze coat may be considered as part of the flood coat provided the surfacing operation is completed within 24 hours after application of the glaze coat. Where glaze coat is used, surface treatment shall completed as soon as weather conditions permit.

Table I

LAPS FOR ROOFING FELTS AND ROLL ROOFING(a)

Layers or plies	Laps in inches for 36-inch width	Starting widths in inches for 36-inch width
1	4	36
2	19	18 and 36
3	24-2/3	12, 24, and 36
4	27-1/2	9, 18, 27 and 36

(a) End laps of roofing felts and roll roofing shall be not less than 6 inches and shall be staggered a minimum of 12 inches.

Table II

NAILING OF BUILT-UP ROOFING LAID DIRECTLY ON DECK(a), FOR FELTS ON ROOF SLOPES ABOVE 1/2 INCH PER FOOT, AND BASE SHEETS LAID ON ALL SLOPES WITHOUT MOPPING

Type of Deck	Base Sheet	Mopped Felts
Plywood	Nail 6" on center, staggered in two rows 2" and 6" from lower edge.	Nail 12" on centers staggered in two rows 2" and 6" from upper edge.

(a) Includes the use of conventional nails or other approved fasteners.

* * * * *

SECTION 14B

STEEL DOORS AND FRAMES

Index

1. Applicable Publications
2. Shop Drawings
3. General Requirements For Doors and Frames
4. Construction of Frames
5. Construction of Doors
6. Delivery and Storage
7. Installation
8. Hardware
9. Calking
10. Steel Plate

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 Federal Specifications (Fed. Spec.).

TT-C-00598C (COM-NBS) & Am-1	Calking Compound, Oil and Resin Base Type (for Building Construction)
TT-P-38D & Am-1	Paint, Aluminum, Ready-Mixed

1.2 American National Standards Institute, Inc. (ANSI) Standards.

A 115.1-1971	Mortise Door Locks for 1-3/4" Doors
A 115.2-1971	Bored or Cylindrical Locks for 1-3/4" Doors
A 123.1-1974	Nomenclature for Steel Doors and Steel Door Frames
A 156.1-1970	Butts and Hinges
A 156.7-1972	Template Hinge Dimensions

1.3 American Society for Testing and Materials (ASTM) Publications.

A 366-72	Steel, Carbon, Cold-Rolled Sheet, Commercial Quality
A 569-72	Steel, Carbon (0.15 Maximum, Percent), Hot Rolled Sheet and Strip, Commercial Quality
D 1692-74	Rate of Burning or Extent of Burning of Cellular Plastics Using a Supported Specimen by a Horizontal Screen

1.4 Builders Hardware Manufacturers Association (BHMA) Standards.

501-1971 (Rev. June 1974)	Auxiliary Locks

2. SHOP DRAWINGS shall be submitted for approval in accordance with the SPECIAL PROVISIONS. Shop drawings shall indicate the location of door and frame, elevation of type of door and frame, details of construction, method of assembling sections, location and extent of hardware reinforcement, hardware locations, type and location of struts and anchors for frames, and thicknesses of metal. Shop drawings shall include specifications for shop painting including pretreating and painting materials and processes, and catalog cuts or descriptive data for the weatherstripping and thresholds.

3. GENERAL REQUIREMENTS FOR DOORS AND FRAMES.

3.1 Steel. Door and frame shall be factory fabricated from steel conforming to ASTM Specifications A 366 or A 569, stretcher level degree of flatness, pickled and oiled if of hot rolled material, and Manufacturers' Standard Gages specified hereinafter for the various uses.

3.2 Shop Painting. After fabrication, door and frame shall be thoroughly cleaned, pretreated to provide a strong bond between metal and paint, and shop painted with a rust-inhibiting primer paint.

3.3 Workmanship. The finished items shall be rigid, neat in apparance, and free from defects, warp, or buckle. Molded members shall be sharp in detail, straight, and true. Corner joints shall be coped or mitered, well-formed, and in true alinement. Exposed welded joints shall be dressed smooth.

3.4 Preparation For Hardware. Door and frame shall be prepared for hardware in conformance with paragraph: HARDWARE; the requirements of American National Standards A 115.1, A 115.2, and A 123.1; and the application locations specified in paragraph: HARDWARE. Cutting, reinforcing, drilling, and tapping of door and frame shall be done at the factory. Door frame shall be prepared for silencers, and rubber silencers shall be provided with the frame. Reinforcement of door and frame for hardware shall be as specified in table I at the end of this section.

3.5 Weatherstripping for head and jamb protection shall be spring-tension type with hemmed edges and shall be of bronze, aluminum, or corrosion-resisting steel. Spring bronze or spring aluminum shall be not less than 0.008 inch thick; and corrosion-resisting steel shall be not less than 0.005 inch thick. Weatherstripping for bottom of doors shall be of the surface-mounted sweep type consisting of 1/8-inch thick neoprene in an extruded aluminum or bronze housing not less than 0.070 inch thick.

3.6 Threshold shall be extruded aluminum or bronze, flat type with a fluted top, and shall provide the proper clearance and an effective seal with the specified weatherstripping.

4. CONSTRUCTION OF FRAMES. Pressed steel frames for door shall be of the combination buck, frame, and trim type of the sizes and details shown. Gages of metal shall be not lighter than 16-gage for 1-3/4-inch thick door. Frames shall be knockdown type or welded unit type.

4.1 Welded Unit Type Frame shall have header and jambs secured at the corners either by internal welding of faces or by welded splice plates and shall be further secured at the rabbet either by welding or by mechanical interlock. As an alternate, the headers and jambs shall be secured at the corners by external welding of faces and grinding smooth. Faces of frames at junction of head and jamb shall present neat line joints.

4.2 Knockdown Type Frames shall have joints that interlock rigidly so as to maintain alinement of parts and provide functionally satisfactory performance of completed frames when field assembled. Faces of frames at junction of head and jambs shall present neat line joints.

4.3 Anchors. Frame shall be provided with a minimum of three wall anchors per jamb as required for the adjoining wall construction, and anchors for attachment of frame to the floor. Anchors shall be of not less than 18 gage steel or 3/16 inch diameter wire.

5. CONSTRUCTION OF DOORS. Doors shall be of the type, size, and design shown. Door clearances shall not exceed the following: 1/8 inch at jambs and head; and 3/4 inch at bottom measured from finished floorline. Exterior door shall have top and bottom edges closed flush and sealed against water penetration.

5.1 Flush Doors shall be of full flush construction. Doors shall be internally reinforced to resist impact and to insure flatness of finished surfaces by steel members welded in place, water-resistant honeycomb core glued in place, or rigid insulation core glued or foamed in place. Doors with metal reinforcing shall have sound deadening material applied to the interior of the door to eliminate metallic sound incident to normal door operation. Honeycomb core material shall have a crushing strength of not less than 4,000 psf, and the lamination shall withstand not less than 1,500 psf surface shear. Foam insulation core material shall have a compressive strength of not less than 1,500 psf and a shear strength of not less than 18 psi, shall have an insulation-to-steel strength at least equal to the strength of the insulation, shall be dimensionally stable within plus or minus 5 percent of volume after 24-hour exposure to temperatures ranging from minus 15 degrees F. to 165 degrees F., shall have no voids exceeding 1/2 inch in any direction, and shall have a density of not less than 1.0 pound per cubic foot. Foam insulation shall be rated as self-extinguishing when tested in accordance with ASTM Test Method D 1692. Solid mineral insulation core material shall have a density of not less than 20 pounds per cubic foot.

5.1.1 Full Flush Construction shall have face sheet of not less than 18-gage steel, shall have no seams or joints on door faces, and shall have top and bottom closed with a recessed channel or a flush end closure treatment.

6. DELIVERY AND STORAGE. To provide protection during shipment, welded unit type frame shall be provided with temporary steel spreaders at the bottom of each frame; and knockdown type frames shall be securely strapped in a bundle. Materials shall be delivered to the site in undamaged condition, stored out of contact with the ground and under a weathertight covering, permitting good air circulation. Whenever they become evident, abraded, scarred or rusty areas shall be cleaned and touched up with the paint used for the shop painting.

7. INSTALLATION. Frame shall be plumbed, leveled, and rigidly secured in place. Temporary spreader shall be installed until the wall at the frame is completed and the frame is securely anchored in its final position. Wall anchors on doorframes shall be installed approximately at the hinge and strike levels. Doors shall be installed in conjunction with the application of hardware. Weatherstripping and thresholds shall be installed at exterior door openings to provide a weathertight installation.

TABLE I

REINFORCEMENT

Hardware Item	Minimum Gage		Minimum Size, Inches
Hinges	Door	10	8 x 1-5/8 (1-3/4-inch thick door)
	Frame	10	8 x 1-5/8 (1-3/4-inch thick door)
Mortise Locksets and Deadlocks	Door	14	10 x 3-3/4
	Frame	14	6-1/2 x 1-1/2 (1-3/4-inch thick door)

Lighter gages may be used if formed to a channel-shape or a U-shape that provides rigidity equivalent to that of flat reinforcements of specified gage. Gage and size of reinforcement for hardware items not listed above shall be as required by the templates for those items.

8. HARDWARE.

8.1 Butts and Hinges shall conform to ANSI Standards A 156.1 and A 156.7, Type A 8112, with non-removable pins, finish USP

8.2 Application of Hardware.

8.2.1 Top hinge shall be installed with center of hinge not more than 9-3/4 inches below the top of door.

8.2.2 Bottom hinge shall be installed with the center of hinge not more than 10-3/8 inches above the finish floor.

8.2.3 Intermediate hinge shall be installed equidistant between the top and bottom hinges.

8.2.4 Deadlock shall be centered 40-5/16 inches above the finish floor.

8.3 Deadlock shall conform to BHMA Standard 501, Mortise type, cylinder operated, E16000 series.

8.4 Keying. Keys shall be stamped with change number and the inscription "U.S. Property - Do Not Duplicate". Two keys shall be supplied.

9. CALKING.

9.1 General. Calking shall be installed in exterior and interior joints around metal frames built into exterior walls, and wherever else indicated or specified.

9.2 Materials.

9.2.1 Calking Compound shall conform to Federal Specification TT-C-598, Type I, and shall be delivered to the building site in the manufacturer's original sealed packages.

9.2.2 Sealer shall be ready-mixed aluminum paint conforming to Federal Specification TT-P-38.

9.3 Application. Calking compound shall be applied with gun, using a nozzle of proper size to fit the joint width, and shall be forced into grooves with sufficient pressure to expel all air and fill the groove solidly. Calking shall be uniformily smooth and free of wrinkles, and unless otherwise noted, shall be left sufficiently convex to result in a flush joint when dry. Calking around openings in masonry shall include the entire perimeter of each opening.

9.4 Cleaning. The surfaces adjoining calked joints shall be cleaned of smears or other soiling resulting from the calking application.

10. STEEL PLATE mounted on inside of door shall conform to requirements of the section: MISCELLANEOUS METAL AND MATERIALS.

* * * * *

SECTION 14D

CARPENTRY

Index

1. Applicable Publication
2. Materials
3. Grading and Marking
4. Sizes
5. Moisture Content
6. Delivery and Storage
7. Samples and Descriptive Data
8. Preservative Treatment
9. Installation of Framing and Miscellaneous Wood Members
10. Installation of Sheathing

1. APPLICABLE PUBLICATION. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 Federal Specification (Fed. Spec.).

FF-N-105B & Am-3	Nails, Brads, Staples and Spikes: Wire, Cut and Wrought
UU-B-790a & Int Am-1	Building Paper, Vegetable Fiber: (Kraft, Waterproofed, Water Repellent and Fire Resistant)

1.2 Military Specification (Mil. Spec.).

MIL-L-19140C & Int. Am-1 (SHIPS)	Lumber and Plywood, Fire-Retardant Treated

1.3 U.S. Department of Commerce, Product Standard (Prod. Std.).

PS 1-74	Construction and Industrial Plywood
PS 20-70 & Am-1	American Softwood Lumber Standard

1.4 American Institute of Timber Construction (AITC), publication.

AITC 109-74	Treating Standards for Structural Timber Framing
Unnumbered	Timber Construction Manual (1974; and Errata)

1.5 American Society for Testing and Materials (ASTM), publication.

D 226-75	Asphalt-Saturated Roofing Felt for Use in Membrane Waterproofing and Built-Up Roofing

1.6 American Wood Preservers Bureau (AWPB), standard.

LP-2	Softwood Lumber, Timber and Plywood Pressure Treated With Water-Borne Preservatives for Above Ground Use (Rev. Jul 1975)
LP-3	Softwood Lumber, Timber and Plywood Pressure Treated With Light Hydrocarbon Solvent-Penta Solution for Above Ground Use (Rev. Jul 1975)

LP-4	Softwood Lumber, Timber and Plywood Pressure Treated With Volatile Hydrocarbon Solvent-Penta Solution for Above Ground Use (Rev. Jul 1975)
LP-55	Softwood Lumber, Timber and Plywood Pressure Treated with Creosote or Creosote-Tar Solutions for Use in Ground Contact Use (Rev. Jul 1975)

1.7 National Forest Products Associations (NFPA), publication.

National Design Specification for Stress-Grade Lumber and Its Fastenings (1973 Edition & Supplement (Apr 1973, Rev. Nov. 1974))

Manual for House Framing (1970)

1.8 Northeastern Lumber Manufacturers Association, Inc. (NELMA), publication.

Standard Grading Rules for Northeastern Lumber (January 1974 Supplement No. 1; Errata)

1.9 Northern Hardwood and Pine Manufacturers Association, Inc. (NHPMA)., publication.

Official Grading Rules for Eastern White Pine, Norway Pine, Jack Pine, Eastern Spruce, Balsam Fir, Eastern Hemlock and Tamarack (September 1, 1970, and Supplement Nos. 1 & 2)

1.10 West Coast Lumber Inspection Bureau (WCLB), standard.

No. 16 Standard Grading and Dressing Rules for Douglas Fir, Western Hemlock, Western Red Cedar, White Fir, Sitka Spruce Lumber (Oct 1, 1975)

1.11 Western Wood Products Association (WWP), publication.

Standard Grading Rules for Western Lumber (July 1, 1974)

2. MATERIALS shall conform to the respective specifications and other requirements specified below.

2.1 Accessories and Nails.

2.1.1 Anchor Bolts. Steel, corrosion resistant, size as indicated, complete with nuts and washers.

2.1.2 Bolts; Lag, Toggle, and Miscellaneous Bolts, and Screws. Type, size, and corrosion resistant finish best suited for intended use.

2.1.3 Clip Angles. Steel, 3/16-inch thick, size best suited for intended use; or zinc-coated steel or iron commercial clips designed for connecting wood members.

2.1.4 Expansion Shields. Type and size best suited for intended use.

2.1.5 Joist Hangers. Steel or iron, zinc-coated, size to fit members where used, sufficient strength to develop the full strength of supported member, complete with any special nails required.

2.1.6 Nails and Staples. Size and type best suited for purpose, in accordance with Fed. Spec. FF-N-105 when applicable to type used. For sheathing and subflooring, length of nails shall be sufficient to extend 1 inch into supports. In general, 8-penny or larger nails shall be used for nailing through 1-inch thick lumber and for toe nailing 2-inch thick lumber; 16-penny or larger nails shall be used for nailing through 2-inch thick lumber.

2.1.7 Timber Connectors. Unless otherwise specified, in accordance with NFPA publication, National Design Specification for Stress-Grade Lumber and Its Fastenings; TPI-74; or AITC publication, Timber Construction Manual.

2.2 Structural and Miscellaneous Wood Members.

2.2.1 Structural Members. Species and grades listed in the NFPA publication, National Design Specification for Stress-Grade Lumber and Its Fastenings. Structural lumber shall have design stresses not less than 1,500 F_b, 1,000 F_t, 385 F_c for engineered uses with 1,700,000 E. Design of members and fastenings shall conform to AITC publication, Timber Construction Manual.

2.2.2 Nonstress Graded Members shall include plates, caps, blocking, and nailers. Members shall be standard grade or No. 2 grade. Nonstress member grades shall conform to the National Grading Rule for Dimension Lumber established in conformance with Section 10 of Prod. Std. PS 20 and as applied in individual grading rules of applicable grading agencies. For species graded under other grading rules, grade used shall be equivalent to grades outlined above. Sized shall be as follows unless otherwise shown.

Member	Size (inches)
Blocking	2 x 4 or such larger size as required when applied between framing members; smaller sizes when approved for a specific use.

2.2.3 General Use Plywood. U.S. Department of Commerce, Prod. Std. PS 1, grade and thickness as follows.

2.3 Moisture Barrier. Building paper, Fed. Spec. UU-B-790, type I, grade D, style optional; or asphalt saturated felt, ASTM D 226, type I.

2.4 Sheathing. Plywood for roof sheathing.

2.4.1 Plywood. Prod. Std. PS 1, grade A-C with exterior glue for roof sheathing. Roof sheathing shall be 3/4-inch minimum thickness with an Identification Index of 24/0 or greater for supports 36 inches on center.

3. GRADING AND MARKING. Lumber and plywood shall bear the grademark, stamp or other identifying marks indicating grades of material and rules or standards under which produced. Such identifying marks on a material shall be in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification. The inspection agency for lumber shall be certified by the Board of Review, American Lumber Standards Committee, to grade species used.

4. SIZES. Lumber sizes shall conform to Prod. Std. PS 20, and unless otherwise specified, lumber shall be surfaces on four sides. Sizes for materials other than lumber shall conform to requirements of the rules or standards under which produced. Size references unless otherwise specified are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which the product is produced.

5. MOISTURE CONTENT. At the time lumber and other materials are delivered and when installed in the work their moisture content shall be as follows:

Treated and untreated lumber over 2 inches in thickness: 25 percent maximum

Materials other than lumber: In accordance with standard under which product is produced.

6. DELIVERY AND STORAGE. Materials shall be delivered to the site in undamaged condition, stored in fully covered, well ventilated areas, and protected from extreme changes in temperature and humidity.

7. SAMPLES AND DESCRIPTIVE DATA. The following shall be submitted for approval.

Accessories and nails: 2 of each accessory and four of each kind of nail with description of application for each.

8. PRESERVATIVE TREATMENT. To the extent indicated below, wood members and plywood shall be preservative-treated by pressure methods and so marked in accordance with the AWPB Standards. Unless otherwise specified it will include all wood members exposed to weather or in conract with masonry or concrete.

Treatment of wood to be painted or to make contact with painted parts, and wood to which finishing materials will be fastened, shall be in accordance with AWPB LP-2 or LP-4. Treatment of wood used in conjunction with built-up roofing shall be in accordance with AWPB LP-2. Wood treated with oil-borne preservatives shall be clean, free from surface oil, and properly seasoned for use in building construction. Wood treated with water-borne preservatives shall be air-dried or kiln-dried to the moisture content specified for lumber and marked with the word "Dry". Treated wood which is cut shall be brush-coated with the preservative used in the original treatment.

9. INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS.

9.1 General. Members shall be closely fitted, accurately set to required lines and levels, and rigidly secured in place. Nailing shall be in accordance with the Recommended Nailing Schedule as contained in the NFPA publication, Manual for House Framing. Where detailed nailing requirements are not specified, nail size and nail spacing shall be

sufficient to develop an adequate strength for the connection without splitting the members. Installation of timber connectors shall conform to applicable requirements of the NFPA publication, National Design Specification for Stress-Grade Lumber and Its Fastenings. Rafters and joists shall be set with crown edge up. Leveling of joists, beams, and girders on masonry or concrete shall be with slate or steel.

9.2 Roof Framing with Rafters. Tops of rafters shall form a true plane. Ridge members shall be of depth equal to cut on rafters where practicable, but in no case less than depth of rafters. Ridges shall be straight and true intersections of roof planes. Rafters shall be well spiked to wall plate.

9.3 Blocking shall be provided as necessary for application of sheathing, and other materials or building items. Blocking shall be cut to fit between framing members and rigidly nailed thereto.

10. INSTALLATION OF SHEATHING.

10.1 Plywood Sheathing shall be applied with edges 1/8 inch apart at side joints and 1/16 inch apart at end joints, and nailed at supported edges at six inches on center and at intermediate supports 12 inches on center. Nailing of edges shall be 3/8 inch from the edges. Roof sheathing shall have face grain at right angles to supports, end joints made over supports, and end joints staggered.

* * * * *

SECTION 14F

METAL TOILET DOORS

1. APPLICABLE PUBLICATIONS. The following publication of the issue listed below, but referred to thereafter by basic designation only, forms a part of this specification to the extent indicated by the references thereto.

1.1 Federal Specification (Fed. Spec.).

RR-P-1352	Partitions, Metal Toilet, Complete

2. GENERAL. Metal toilet doors shall conform to the layouts shown. Zinc coating on steel sheets shall be 1 25 commercial coating class, and color of panels noted on the drawings shall be selected from the manufacturer's standard colors.

2.1 Shop Drawings. Shop drawings shall be submitted for approval in accordance with the SPECIAL PROVISIONS. Shop drawings shall show plans, elevations, details of construction, gauges of metal, hardware, reinforcing, fittings, mountings, and anchorings.

3. TOILET DOORS shall conform to RR-P-1352. Size shall be as shown. Finish surface of panels shall be baked enamel.

4. INSTALLATION. Toilet doors shall be installed straight and plumb with all horizontal lines level and rigidly anchored to the supporting construction. Drilling and cutting for installation of anchors shall be at locations that will be concealed in the finished work. Doors shall have a uniform vertical edge clearance of approximately 3/16 inch and shall rest open at approximately 30 degrees when unlatched. Baked enamel finish shall be touched-up with the same type and color of paint that was used for the finish. Toilet doors shall be cleaned and protected from damage until acceptance.

* * * * *

SECTION 14H

PAINTING, GENERAL

Index

1. Applicable Publications
2. General
3. Materials
4. Quality Assurance Provisions
5. Cleaning, Preparation, and Pretreatment of Surfaces
6. Paint Application
7. Miscellaneous
8. Painting Schedule
9. Surfaces Not Requiring Painting
10. Cleaning

1 APPLICABLE PUBLICATIONS. The following publications of the issues below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 Federal Specifications.

SS-C-1960/3	Cement, Portland
TT-C-535B & Am-1	Coating, Epoxy, Two-Component for Interior Use on Metal, Wood, Wallboard, Painted Surfaces, Concrete and Masonry
TT-E-489F & Int Am-1	Enamel, Alkyd, Gloss (For Exterior and Interior Surfaces)
TT-E-508b & Am-4	Enamel: Interior Semigloss, Tints and White
TT-E-509b & Am-2	Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints
TT-E-543a & Am-1	Enamel, Interior, Undercoat, Tints and White
TT-E-545B	Enamel, Odorless, Alkyd, Interior, Undercoat. Tints and Whites
TT-F-1098D (COM-NBS)	Filler, Solvent Thinned, for Porous Surfaces (Concrete, Concrete Block, Stucco, Etc.) (For Interior and Exterior Use)
TT-P-19C	Paint, Acrylic Emulsion, Exterior,
TT-P-31D	Paint, Oil; Iron-Oxide, Ready-Mixed, Red and Brown
TT-P-37C & Am-3	Paint, Alkyd Resin; Exterior Trim, Deep Colors
TT-P-38D	Paint, Aluminum, Ready-Mixed
TT-P-55b & Am-2	Paint, Polyvinyl Acetate Emulsion, Exterior
TT-P-57b & Am-1	Paint, Zinc Yellow-Iron Oxide-Base, Ready-Mixed
TT-P-86G	Paint, Red-Lead-Base, Ready-Mixed
TT-P-105a & Am-1	Paint, Oil: Chalk-Resistant, Lead-Free, Exterior Ready-Mixed White and Tints
TT-P-320C	Pigment, Aluminum; Power and Paste for Paint
TT-P-615d & Am-2	Primer Coating: Basic Lead Silico Chromate, Ready Mixed
TT-P-641G	Primer Coating; Zinc Dust-Zinc Oxide (For Galvanized Surfaces)
TT-P-645	Primer, Paint, Zinc-Chromate, Alkyd Type
TT-S-708a & Am-1	Stain, Oil; Semi-Transparant, Wood, Exterior
TT-S-711b & Am-2	Stain; Oil Type, Wood, Interior
TT-V-119D & Am-1	Varnish, Spar, Phenolic-Resin

1.2 Federal Standards.

No. 141a & Change Notices 1, 2, 3, & 4	Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling, and Testing
No. 595a & Change Notices 1, 2, 3, & 4	Colors

1.3 Military Specifications.

MIL-S-12935D	Sealer, Surface; for Knots
MIL-P-15328C & Am-1	Primer (Wash), Pretreatment, Blue (Formula No. 117-B for Metals)
MIL-P-26915A (USAF) & Am-1	Primer Coating, Zinc Dust Pigmented, for Steel Surfaces
MIL-P-52324 (MO)	Paint, Oil, Alkyd, Exterior, White and Light Tints

2. GENERAL. The term "paint," as used herein, includes emulsions, enamels, paints, stains, varnishes, sealers, cement-emulsion filler and other coatings, whether used as prime, intermediate, or finish coats.

3. MATERIALS. Paints shall be in sealed containers that plainly show the designated name, formula or specification number, batch number, color, quantity involved, date of manufacture, manufacturer's formulation number, manufacturer's directions, and name of manufacturer, all of which shall be plainly legible at the time of use. Pigmented paints shall be furnished in containers not larger than 5 gallons. Materials shall conform to the specifications shown in the painting schedule herein and to the requirements hereinafter specified. Contractor inspection responsibility shall be as specified in paragraph titled QUALITY ASSURANCE PROVISIONS. When the required quantity of a material of a particular color is 25 gallons or less, a proprietary brand material similar to that specified may be proposed, and the responsibility of the Contractor for inspection, as specified above, may be waived.

3.1 Cement-Emulsion Filler Coat shall be either acrylic base cement-emulsion filler or polyvinyl acetate base cement-emulsion filler, at the option of the Contractor. However, when used in an exterior system, the polyvinyl acetate base cement-emulsion filler coat shall be used only with a polyvinyl acetate exterior emulsion finish paint, and the acrylic base cement-emlusion filler coat shall be used with an acrylic exterior emulsion finish paint or with a styrene finish paint.

3.1.1 Acrylic Base Cement-Emulsion Filler.

3.1.1.1 Materials.

3.1.1.1.1 White Portland Cement shall conform to Federal Specification SS-C-1960/3, type I or II.

3.1.1.1.2 Aggregate shall be washed silica sand containing not more than 0.5 percent colloidal clay. One hundred percent shall pass through a No. 20 sieve, 15-30 percent shall pass a No. 70 sieve, and 0-15 percent shall pass a No. 100 sieve.

3.1.1.1.3 Mixing Liquid, acrylic emulsion polymer, 46 percent nonvolatile, shall be the same resin emulsion as used in formulating acrylic emulsion paint, exterior, specified below.

3.1.1.1.4 Acrylic emulsion paint, exterior, shall conform to Federal Specification TT-P-19.

3.1.1.2 Composition.

White portland cement	16.5 pounds
Aggregate	33.5 pounds
Mixing liquid	0.75 gallon
Potable water, maximum	1.0 gallon
Acrylic emulsion paint, exterior	1.0 gallon

3.1.1.3 Mixing Instructions. Mixing shall be in accordance with procedures hereinafter specified for polyvinyl acetate base cement-emulsion filler.

3.1.2 Polyvinyl Acetate Base Cement-Emulsion Filler.

3.1.2.1 Materials.

3.1.2.1.1 White Portland Cement shall conform to Federal Specification SS-C-1960/3, type I or II.

3.1.2.1.2 Aggregate shall be washed silica sand containing not more than 0.5 percent colloidal clay. One hundred percent shall pass through a No. 20 sieve, 15-30 percent shall pass a No. 70 sieve, and 0-15 percent shall pass a No. 100 sieve.

3.1.2.1.3 Mixing Liquid, polyvinyl acetate emulsion polymer, shall be the same resin emulsion as used in formulating polyvinyl acetate emulsion paint, exterior, specified below. The mixing liquid shall be factory prepared and shall be proportioned as follows, by weight.

	Percent
Vinyl polymer (55 percent nonvolatile)	92.6
Carbitol acetate	3.7
Potable water	3.7

3.1.2.1.4 Polyvinyl acetate emulsion paint, exterior, shall conform to Federal Specification TT-P-55, type II.

3.1.2.2 Composition.

White portland cement	16.5 pounds
Aggregate	33.5 pounds
Mixing liquid	0.75 gallons
Potable water, maximum	1.0 gallon
Polyvinyl acetate emulsion paint, exterior	1.0 gallon

3.1.2.3 Mixing Instructions. Cement and aggregate shall be dry mixed so that uniform distribution and intermixing are obtained. Mixing liquid and one-half of the total amount of water shall be added gradually to the white portland cement and aggregate with constant stirring until a thick, smooth material is obtained. Emulsion paint shall then be added to the foregoing and stirred until uniformity is obtained. The blend shall have a thick, creamy consistency. The remainder of the water shall be added if necessary, to obtain a material with adequate application characteristics. Blending resin emulsion or emulsion paint with any other component shall be done with caution; too rapid agitation will cause air entrapment and foaming. Filler shall be free of entrapped air and foam when applied.

3.2 Exterior Emulsion Paint for concrete and masonry surfaces, shall be either exterior polyvinyl acetate emulsion paint conforming to Federal Specification TT-P-55, type II, or exterior acrylic emulsion paint conforming to Federal Specification TT-P-19. Exterior emulsion paint for wood surfaces shall be TT-P-19 only; TT-P-55 shall not be used on wood surfaces. Only one type of emulsion shall be used in an exterior emulsion system.

3.3 Exterior Oil Paint shall conform to the following Federal or Military Specifications.

3.3.1 For Exposures Not Requiring Fume Resistance.

White: TT-P-105; or MIL-P-52324, class (1) (2)
Light tints: TT-P-105; or MIL-P-52324, class 2
Red or Brown: TT-P-31
Other deep Colors: TT-P-37.

3.4 Ferrous-Metal Primer shall conform to Federal Specification TT-P-57, type I; TT-P-86, type I or II; TT-P-615, type I, II, or V; or TT-P-645.

3.5 Zinc-Dust-Containing Paint shall conform to Federal Specification TT-P-641, type II, or Military Specification MIL-P-26915.

3.6 Aluminum Paint shall be ready-mixed conforming to Federal Specification TT-P-38 or shall be field mixed aluminum paint consisting of aluminum paste conforming to Federal Specification TT-P-320, type II, class 2; thinner compatible with the varnish; and varnish conforming to Federal Specification TT-V-119, mixed in the proportions of 2 pounds of paste to not more than 1 pint of thinner to 1 gallon of varnish.

3.7 Vinyl-Type Wash Coat shall conform to Mil. Spec. MIL-P-15328.

4. QUALITY ASSURANCE PROVISIONS. Paint proposed for use shall be stored on the project site in sealed and labeled containers, or segregated at the source of supply, sufficiently in advance of need to allow 30 days for testing. The Contractor shall furnish either one of the following data for all batches in excess of 25 gallons:

a. A test report showing that the proposed batch has met all specification requirements.

b. A test report showing that a previous batch, manufactured using the same formulation as that used in manufacturing the proposed batch, has met all specification requirements, and a report showing test results on the proposed batch for the following properties for which there are requirements in the material specification: weight per gallon, viscosity, fineness of grind, drying time, color, and gloss.

Testing procedures and reports shall be as specified in paragraph 5 of Method 1031.2 of Federal Standard 141. Upon notification by the Contractor that the material is at the site or source of supply, a 1-quart sample of each batch, except for small quantities for which the use of proprietary brands has been approved, shall be taken by random selection from the sealed containers by the Contractor in the presence of a representative of the Contracting Officer. The contents of the sampled containers shall be so thoroughly mixed as to render the sample truly representative. Samples shall be clearly identified by designated name, specification number, batch number, project contract number, intended use, and quantity involved. At the discretion of the Contracting Officer, samples may be tested by the Government before approval, or materials may be approved for use based on the test reports furnished. If the materials are approved based on reports furnished by the Contractor, samples will be retained by the Government for possible future testing should the materials appear to be defective during or after application. If the sample is tested by the Government and it fails to meet specification requirements, the material represented by the sample shall be replaced, and the cost of retesting will be deducted from the payments due the Contractor at the rate of $100 per sample retested.

5. CLEANING, PREPARATION, AND PRETREATMENT OF SURFACES.

5.1 General. Hardware, hardware accessories, machined surfaces, plates, similar items in contact with painted surfaces and not to be painted shall be removed, masked, or otherwise protected prior to surface preparation and painting operations. Such removal shall be done by workmen skilled in the trades involved. Exposed nails and other ferrous metal on or in contact with surfaces to be painted with water-thinned paints shall be spot-primed with zinc dust, zinc dust-zinc oxide, basic lead silico chromate, or zinc chromate primer. Surfaces to be painted shall be clean before applying paint or surface treatments. Surfaces not to be painted shall be in a new condition or shall be wire-brushed and touched up to remove all evidence of rust, corrosion, or abrasion. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. Cleaning solvents shall be of low toxicity and shall have a flashpoint in excess of 100 degrees F. Cleaning and painting shall be so programmed that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

5.2 Concrete, Stucco, and Masonry Surfaces to be painted shall be prepared by removing efflorescence, chalk, dust, dirt, grease, oil, asphalt, tar, excessive mortar and mortar droppings, and by roughening to remove glaze. Surface deposits of free iron shall be removed prior to painting. Immediately before coating with cement-emulsion filler, concrete-masonry-unit surfaces to be painted shall be uniformly and thoroughly dampened, with no free surface water visible, by several applications of potable water with a fog spray, allowing time between the sprayings for the water to be absorbed.

5.3 Wood Surfaces.

5.3.1 General. Wood surfaces, except surfaces to be given natural finish, shall be primed and finish-coated as specified in the painting schedule herein. Wood surfaces to be painted shall be cleaned of dirt, oil and other foreign substances with mineral spirits, scrapers, and/or sandpaper. Finished surfaces exposed to view shall be made smooth by sandpapering. Small, dry, seasoned knots shall be surface scraped and thoroughly cleaned, and shall be given a thin coat of knot sealer conforming to Military Specification MIL-S-12935 before application of the priming coat. Pitch on large, open, unseasoned knots and all other beads or streaks of pitch shall be scraped off, or if still soft, shall be removed with mineral spirits or turpentine and the resinous area thinly coated with knot sealer. The surface shall be checked to insure that finishing nails have been properly set; then all holes and surface imperfections shall be primed. After priming, all holes and imperfections in finish surfaces shall be filled with putty or plastic wood filler, colored to match the finish coat if natural finish is required, allowed to dry, and sandpapered smooth. Unless otherwise authorized, painting shall proceed only when the moisture content of the wood does not exceed 12 percent as measured by a moisture meter.

5.3.2 Interior Wood Surfaces to receive stained or natural finish, except as hereinafter specified, shall be properly prepared to approved shade and lightly sanded. Oak and other open-grain wood shall be given the same treatment and, in addition, shall be given a coat of paste wood filler not less than 8 hours after the application of stain. Excess filler shall be removed and the surface then sanded smooth. Each varnish coat shall be lightly sanded prior to application of subsequent coat.

5.4 Ferrous surfaces that have not been shop-coated shall be solvent-cleaned to remove oil and grease. Surfaces that contain loose rust, loose mill scale, and other foreign substances shall be mechanically cleaned by power wirebrushing or sandblasting. Minor amounts of residual rust, that cannot be removed except by thorough blast-cleaning, and tight mill scale that cannot be removed by applying a sharp knife to any edge, will be allowed to remain. After cleaning, one coat of ferrous-metal primer shall be applied to ferrous surfaces to receive paint other than asphalt varnish.

5 4.1 Shop Coated Ferrous Surfaces shall be stored out of contact with the ground in such manner and location as will minimize the formation of water-holding pockets, soiling, contamination and deterioration of the paint film. Such metal work shall be protected from corrosion before and after installation by treating corroded areas immediately upon detection. Abraded or corroded spots on shop-coated surfaces shall be wire-brushed and touched up with material similar to the shop coat

5.5 Galvanized Surfaces to be painted shall be solvent-cleaned and treated with vinyl-type wash coat. Galvanized surfaces not to be painted shall be solvent-cleaned.

5.6 Aluminum and aluminum-alloy surfaces to be painted shall be solvent-cleaned to remove oil and grease and then treated with vinyl-type wash coat. Aluminum and aluminum-alloy surfaces not to be painted shall be solvent-cleaned. Painting to protect aluminum from contact with dissimilar materials is specified under the section of the specifications covering the specific item.

6. PAINT APPLICATION.

6.1 General. The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. The hiding shall be complete, and each coat shall be so applied as to produce film of uniform thickness. Special attention shall be given to insure that all surfaces including edges, corners, crevices, welds, and rivets receive a film thickness equivalent to that of adjacent painted surfaces. Respirators shall be worn by persons engaged or assisting in spray painting. Adjacent areas and installations shall be protected by the use of drop cloths, or other approved precautionary measures shall be taken. Metal or wood surfaces adjacent to surfaces to receive water-thinned paints shall be primed and/or touched up prior to the application of water-thinned paints.

6.2 Coating Progress. Sufficient time shall elapse between successive coats to permit proper drying. This period shall be modified as necessary to suit adverse weather conditions. Oil base or oleoresinous solvent-type paints shall be considered dry for recoating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

6.3 Storage, Mixing, and Thinning.

6.3.1 General. At time of application, paint shall show no signs of hard settling, excessive skinning, livering, or other deterioration. Emulsion paints shall be protected from exposure to cold weather by storing in shelters so as to prevent freezing of the paint. Paint shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Paints of different manufacturers shall not be mixed together. Where necessary to suit conditions of surface, temperature, weather, and method of application, packaged paint other than cement-emulsion filler may be thinned immediately prior to application in accordance with the manufacturer's directions, but not in excess of 1 pint of suitable thinner per gallon. The use of thinner for any reason shall not relieve the Contractor from obtaining complete hiding.

6.3.2 Vinyl-type Wash Coat conforming to Military Specification MIL-P-15328 shall be mixed by adding 1 volume of acid component to 4 volumes of resin component. The acid component shall be added slowly, with constant stirring, to the resin component. After mixing, the wash coat shall be used within 8 hours. If additional thinning is required to maintain a wet spray, reduction shall be made with normal butyl alcohol or 99 percent isopropyl alcohol.

6.4 Atmospheric Conditions. Paints other than water-thinned coatings shall be applied only to surfaces that are completely free of surface moisture as determined by sight or touch. In no case shall paint be applied to surfaces upon which there is visible frost or ice. While painting is being done, the temperature of the surfaces to be painted and of the atmosphere in contact therewith shall be at or above 50 degrees F. for water-thinned coatings and 45 degrees F. for other coatings. During periods of inclement weather, painting may be continued by inclosing the surfaces with temporary shelters and applying artificial heat, provided the temperature requirements prescribed above are maintained. Unvented combustion type heaters will not be permitted.

6.5 Time Between Surface Preparation and Painting. Surfaces that have been cleaned, pretreated, and/or otherwise prepared for painting shall be given a coat of the specified first-coat material as soon as practicable after such preparation has been completed, but in any event prior to any deterioration of the prepared surface.

6.6 Method of Paint Application.

6.6.1 Metal. First coats other than vinyl-type wash coats shall be applied by brush, except that where the item has been shop primed or field primed, the first coat may be applied by brush, roller, or spray. Subsequent coats may be applied by brush, roller, or spray. Vinyl-type wash coats may be applied by brush, spray, or swab.

6.6.2 Exterior Wood Surfaces to Receive Natural Finish. The finish shall be applied by brushing with the grain of the wood for the full length of the board or course of siding without stopping for more than 5 minutes. The finish shall be stirred frequently during application to maintain uniform suspension of the pigments.

6.6.3 Other Surfaces may be coated by brush, roller, or spray, except for filler coats. Cement-emulsion filler shall be vigorously scrubbed into the surface with a stiff-bristle brush having Tampico or Palmyra bristles not longer than 2-1/2 inches. Application of solvent-thinned filler shall be applied by brush, allowed to set for 3 to 5 minutes or until the filler becomes tacky, and the excess filler material removed with a rubber squeegee. Surface voids, pores, and cracks shall be filled, and the dry film shall be uniform and free from pinholes or other voids. Surface irregularties need not be completely filled. The material shall not be applied over calking compound.

6.6.4 Exterior Emulsion Paint. At least 24 hours shall elapse before applying exterior emulsion paint over cement-emulsion filler coat. When the ambient temperature is in excess of 85 degrees F., cement-emulsion-filler surfaces shall be lightly dampened with a fog spray of potable water immediately prior to application of the subsequent paint coat.

6.6.5 Vinyl-Type Wash Coat shall be applied at a spreading rate of 250 to 300 square feet per gallon, to give a dry-film thickness of from 0.3 to a maximum of 0.5 mil. Care shall be exercised in spray application to avoid the deposition of dry particles on the surface. A wet spray shall be maintained at all times. Surfaces treated with the wash coat shall be permitted to dry for not less than 1 hour and shall be coated as soon thereafter as practicable but within 48 hours after application and prior to any deterioration or accumulation of dust or dirt.

6.6.6 Special Requirements.

6.6.6.1 Rollers for applying enamels shall have a short nap. Rollers for applying paint to masonry surfaces shall be a type designed for that purpose.

6.6.6.2 Brushes used for emulsion paint shall be soaked in water for a period of 2 hours prior to brushing.

6.7 Exterior Wood Surfaces to Receive Natural Finish. On smooth surfaces the finish shall be applied at a spreading rate of 400 to 500 square feet per gallon. On rough surfaces the finish shall be spread at the rate of 200 to 250 square feet per gallon.

6.8 Exterior Ferrous Surfaces to Receive Vinyl System. Vinyl paints V-766b and V-102b shall be thinned for spraying 10 to 30 percent by volume with T-10 thinner. The vinyl zinc rich VZ-107 paint shall be thinned for spraying 20 or 30 percent by volume with methyl isobutyl ketone which contains not more than 0.15 percent water. The vinyl paint system shall be spray applied to an average dry film thickness of 6.5 mils for the completed system, and the thickness at any point shall be not less than 5.5 mils. The thickness of the zinc-rich prime coat shall be 1.5 to 2.0 mils. The zinc-rich paint shall be mixed with a power stirrer just prior to use, in the ratio of 5.9 pounds of zinc dust to a gallon of vehicle. As a precautionary measure against gelling, it shall be mixed in quantities which will be used within a few hours, and the mixed material shall be protected in closed containers against the pickup of moisture. The zinc-rich paint shall be stirred continuously during application at a rate which will prevent settling; and spraying, once started, shall be carried out with interruptions of such duration as will not permit settling of the zinc pigment in the hose. The amount of thinner shall be varied to suit prevailing wind and temperature conditions but shall at all times be sufficient to provide a wet spray and avoid deposition of particles which are semi-dry when they strike the surface. In order to obtain the necessary thickness per coat, sufficient double spray coats shall be applied as required for each specified coat of paint. A double spray coat shall be applied by first spraying a coat of paint in a single half-lapped spray pass, followed after drying to a tack-free condition by another spray pass applied at the same coverage rate and at right angles to the first. Rivets and similar projections shall receive sprayed paint from every direction in order to insure complete coverage of all faces. Attainment of the specified film thickness in fewer than the prescribed number of coats or spray passes will be acceptable provided that heavier applications do not cause an increase in pinholes, bubbles, blisters or voids in the dried film and provided that not more than 2.0 mils dry film thickness per double spray coat, nor more than 1.0 mil dry film thickness per single spray pass, shall be applied in any event. Undercoats shall be dry before recoating and not more than 2 double spray coats shall be applied in one day.

7. MISCELLANEOUS.

7.1 Installation of Removed Items. Following completion of painting of each space, removed items, listed under paragraph: CLEANING, PREPARATION, AND PRETREATMENT OF SURFACES shall be reinstalled by workmen skilled in the trade involved.

8. PAINTING SCHEDULE. Except as specified under paragraph: SURFACES NOT TO BE PAINTED, the surfaces listed in the PAINTING SCHEDULE shall receive the surface preparation, paints, and number of coats prescribed. Piping shall not be painted until the piping has been tested and approved. Explanatory information for use with the painting schedule is as follows:

8.1 Shop-Painted Items. Surfaces of fabricated and assembled items that are finish-painted by the manufacturer, or specified to be finish-painted under other sections of the specifications, are exempted from the following schedule requirements for surface preparation and painting. Shop-primed items shall receive surface preparation and finish painting as required by this section.

8.2 Colors and Tints, including shades of stain, shall match the respective color specimens selected by the Contracting Officer. Colors and tints shall conform to Federal Standard No. 595. Undercoats shall vary slightly from the color of the next coat. Stains shall conform in shade to manufacturer's standard color.

8.3 Surface Preparation and Pretreatment. Cleaning and pretreatment of surfaces prior to painting shall be accomplished in accordance with the detailed requirements specified.

9 SURFACES NOT REQUIRING PAINTING. The following listed items will not require painting:

Prefinished items
Intake structure grating
Staff gages and gage wells
Guardrail and posts
Fencing
Handrails
Interior and exterior concrete surfaces except
the roof surface of the recorder house
Stone Veneer

10. CLEANING. Cloths and cotton waste that might constitute a fire hazard shall be placed in closed metal containers or destroyed at the end of each day. Upon completion of the work, staging, scaffolding, and containers shall be removed from the site or destroyed in an approved manner. Paint spots, oil, or stains upon adjacent surfaces shall be removed and the entire job left clean and acceptable.

PAINTING SCHEDULE

Surface	Surface Preparation and Pretreatment	1st Coat	2d Coat	3d Coat
Exterior concrete masonry unit and exposed poured concrete in masonry unit construction.	Remove foreign matter, loose particles, and efflorescence. Dampen as specified.	Cement-emulsion filler.	Exterior emulsion paint.	None.
Concrete roof of recorder house	Remove foreign matter, loose particles, and efflorescence.	TT-P-19.	TT-P-19.	None.
Exterior wood surfaces to receive natural finish.	Remove foreign matter.	TT-S-708.	None.	None.
Exterior ferrous surface, exposed unless otherwise specified.	As previous specified.	Exterior oil paint.	Exterior oil paint.	None.
Exterior galvanized surfaces.	As previously specified.	TT-P-641, type II, or MIL-P-26915, type I, class A.	Exterior oil paint.	None.
Exterior aluminum and aluminum-alloy surfaces.	As previously specified.	TT-P-645.	TT-E-489, class A.	None.
Exposed exterior calking compound.	As specified in section: STEEL DOORS AND FRAMES	Aluminum paint.	Same as adjacent areas.	
Interior concrete-masonry-units.	As previously specified for each type of surface. Fill concrete masonry units with cement emulsion filler or TT-F-1098 filler.	TT-C-535.	TT-C-535.	None.
Interior exposed ferrous surfaces, unless otherwise specified.	As previously specified.	TT-E-543 or TT-E-545.	TT-E-508 or TT-E-509.	None.

PAINTING SCHEDULE (Continued)

Surface	Surface Preparation and Pretreatment	1st Coat	2d Coat	3d Coat
Ferrous surfaces of mechanical equipment that has been factory finished.	Clean as required.	None.	None.	None.
Interior galvanized surfaces, unless otherwise specified.	As previously specified.	Same as for adjacent surfaces.		
Interior wood surfaces to receive stain or natural finish, as follows:	Clean and sandpaper as required. Stain with TT-S-711 for shade as necessary. Fill and seal as necessary.	TT-S-711	None.	None.

* * * * *

SECTION 15B

TOILET FACILITIES

Index

1. Applicable Publications
2. Toilet Accessories
3. Accessory Items
4. Chemical Toilet Unit
5. Holding Tanks
6. Sewer Line
7. Excavation, Trenching and Backfilling

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 Federal Specifications (Fed. Spec.).

WW-P-541D/GEN (GSA-FSS) & Am-1	Plumbing Fixtures (Land Use) (General Specification)
WW-P-541/1A (GSA-FSS)	Plumbing Fixtures (Water Closets, Land Use) (Detail Specification)
WW-P-541/8A (GSA-FSS) & Am-1	Plumbing Fixtures (Accessories, Land Use) (Detail Specification)

1.2 American Society for Testing and Materials (ASTM) Standards.

A 185-73	Welded Steel Wire Fabric for Concrete Reinforcement
C 425-75	Compression Joints for Vitrified Clay Bell-and-Spigot Pipe
C 644-74	Asbestos-Cement Nonpressure Small-Diameter Sewer Pipe
C 700-74	Extra Strength and Standard Strength Clay Pipe and Perforated Clay Pipe
D 1869-66 (1972)	Rubber Rings for Asbestos-Cement Pipe

2. TOILET ACCESSORIES.

2.1 General. Each accessory item shall be complete with the necessary mounting plates, anchors, and fasteners. Concealed mounting plates shall be of sturdy construction and may be unpolished or unplated.

2.2 Samples and Descriptive Data. One sample of each accessory proposed for use shall be submitted for approval. Samples shall be accompanied by descriptive data indicating materials of construction, fasteners proposed for use for each type of wall construction, recommended mounting locations, and mounting instructions. Samples will be returned to the Contractor at the site of the work upon completion of the installation of toilet accessories; or the approved samples may be incorporated into the finished work provided they are identified and their locations noted.

2.3 Anchors and fasteners shall be capable of developing a retaining force commensurate with the strength of the accessory to be mounted and shall be well suited for use with the supporting construction. Exposed fasteners shall be of tamperproof design.

3. ACCESSORY ITEMS shall conform to Fed. Spec. WW-P-541 except as otherwise specified.

3.1 Toilet paper holder, Cabinet shall be type I, class Mounting S, Style G, plain carbon steel, chrome plated.

3.2 Seat Cover Dispenser. Dispensers shall be as specified below and shall have a capacity of 500 horizontally folded covers.

3.2.1 Women's Toilet. Seat cover dispenser shall be type I, class 2, Mounting S, Style M.

3.2.2 Men's Toilet. Seat cover dispenser shall be type I, class 2, Mounting S, Style L.

3.2.2 Coat Hook. Coat hook shall be brass, chromium plated. Two hooks in one piece on a wall flange. Four (4) required; installed on inside of each stall door. Install with tow (2) brass screws.

3.3 Grab Bar. Grab bar shall conform to Fed. Spec. WW-P-541, Type IV, Class 2. Stainless steel tube shall be 1-1/4 inches O.D. Grab bar shall be form and length as indicated. Flange shall have screw mounting holes concealed on the lip of the flange. Grab bar shall have a smooth surface. Installed bars shall be capable of withstanding a 500 pound vertical load without becoming loose from the fastenings and without obvious permanent deformation.

3.4 Installation. Toilet accessories shall be securely fastened to the supporting construction in accordance with the approved submittals. Accessories shall be protected from damage from the time of installation until acceptance.

4. CHEMICAL TOILET UNIT shall be completely self-contained, recirculatory flushing toilet, requiring no external source of power for operation. The toilet unit shall use chemicals, pumps, and filters to process and re-use the flushing fluids. The toilet unit shall be manufactured by a manufacturer regularly engaged in the manufacture of chemical toilets. The minimum usable capacity shall be 850 usages (160 usages for handicapped) per unit. The toilet seat shall be type I, class 2, conforming to Fed. Spec. WW-P-541/1A. Unit shall be complete with drain valve and pipe sleeve connection to drain line. Unit shall be bolted to floor as recommended by manufacturer; and shall be located as shown on plan.

5. HOLDING TANKS. Tank unit shall be manufacturer by a manufacturer regularly engaged in the manufacture of precast septic tanks. Influent, and interconnection specials and fittings shall be the manufacturer's standard. Concrete shall be 3,000 psi compressive strength at 28 days (with grade 40 reinforcing bars) conforming to ASTM C94. Reinforcing wire fabric shall be 6" x 6" W10 conforming to ASTM A 185.

5.1 Holding Tanks shall be precast concrete, waterproof, reinforced unit as indicated on the drawings. Each tank unit shall have a liquid capacity of 1,000 gallons. Access covers shall be the manufacturer's standard with embedded lift handles. Covers shall provide a minimum clear opening of 20 inches. Lifr handles shall be fabricated with 3/8 inch diameter corrosion-resistant steel rod with 1-1/2" x 4" minimum hand hole. Tank unit shall be coated inside and outside with the manufacturer's standard bituminous coating material.

6. SEWER LINE.

6.1 Materials. Sewer line between chemical toilet and septic tank may be either vitrified clay pipe or asbestos-cement pipe. Vitrified clay pipe and fittings shall conform to ASTM C 700, bell and spigot type, using compression type joints conforming to ASTM C 425. Asbestos-cement pipe shall conform to ASTM C 644, using rubber rubber ring joints conforming to ASTM D 1869. Fittings for use with asbestos-cement pipe shall have a strenght not less than the pipe.

6.2 Pipe Laying.

a. Pipe shall be protected during handling against impact shocks and free fall and the pipe interior shall be free of extraneous material.

b. Pipe laying shall proceed upgrade with the spigot ends of bell-and-spigot pipe pointing in the direction of the flow. Each pipe shall be laid accurately to the line and grade shown on the drawings. Pipe shall be laid and centered so that the sewer has a uniform invert. As the work progresses, the interior of the sewer shall be cleared of all superfluous materials. When work is not in progress, open ends of pipe and fittings shall be satisfactorily closed so that no trench water or other material will enter the pipe or fittings.

6.2.1 Backfill. As soon as possible after the joint is made, sufficient backfill material shall be placed along the pipe to prevent pipe movement off line or grade.

6.3 Cleanout. Top cleanout riser shall be constructed of vitrified clay pipe and pipe fittings, 6-inch size, with the top section terminating in a standard spigot end of pipe. The top fitting shall consist of precast concrete valve box top section, of a size that will loosely fit the outside of the cleanout riser. The cover designating letters shall be "C. O." Top of cover shall be set one inch above finished grade, or as directed.

7. EXCAVATION, TRENCHING AND BACKFILLING.

7.1 Excavation for pipe will include excavation of all materials required for the placing of the pipe lines. All excavation shall be made by open cut unless otherwise specified elsewhere in these specifications. The banks of trenches shall be kept as nearly vertical as practicable. Unless otherwise indicated, trenches shall be not less than 12 inches wider nor more than 16 inches wider than the outside diameter of the pipe to be laid therein, and shall be excavated true to line, so that a clear space not less than 6 inches nor more than 8 inches in width is provided on each side of the pipe. The maximum width of trench specified applies to the width at and below the level of the top of the pipe; the width of the trench above that level may be made as wide as necessary for sheathing and bracing.

and the proper installation of the work. The bottom of trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe at every point along its entire length, except for portions of the pipe sections where it is necessary to excavate for the proper sealing of pipe joints. Except as otherwise indicated, the bottoms of all trenches excavated shall be rounded so that at least 1/4 of the circumference of the pipes will rest firmly on undisturbed soil. If soft, spongy, unstable material, or material which by reason of its nature cannot be properly shaped or finished to a true pipe subgrade is encountered, it shall be removed and replaced with compacted fill.

7.2 Excavation for Holding Tank shall be sufficient to leave at least 12 inches in the clear between the outer surfaces and the embankment.

7.3 Backfilling. After pipe has been laid and inspected and approved and holding tank installed, trenches shall be backfilled to ground surface with selected material. Material shall be placed in 6-inch maximum thickness layers and compacted with suitable tampers to the density of the adjacent soil.

* * * * *

U.S. ARMY ENGINEER DISTRICT, LOS ANGELES
300 North Los Angeles Street
Los Angeles, California

Army – C. of E. – Los Angeles